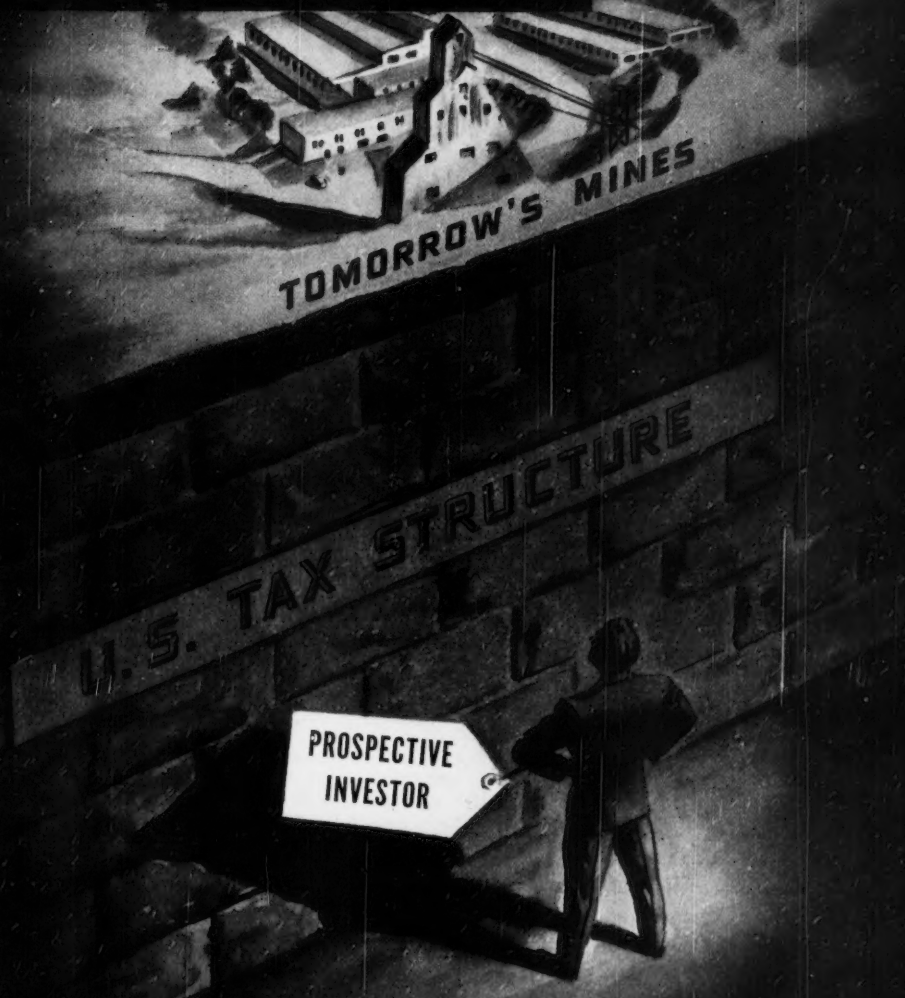
ENGINEERING AND MINING JOURNAL

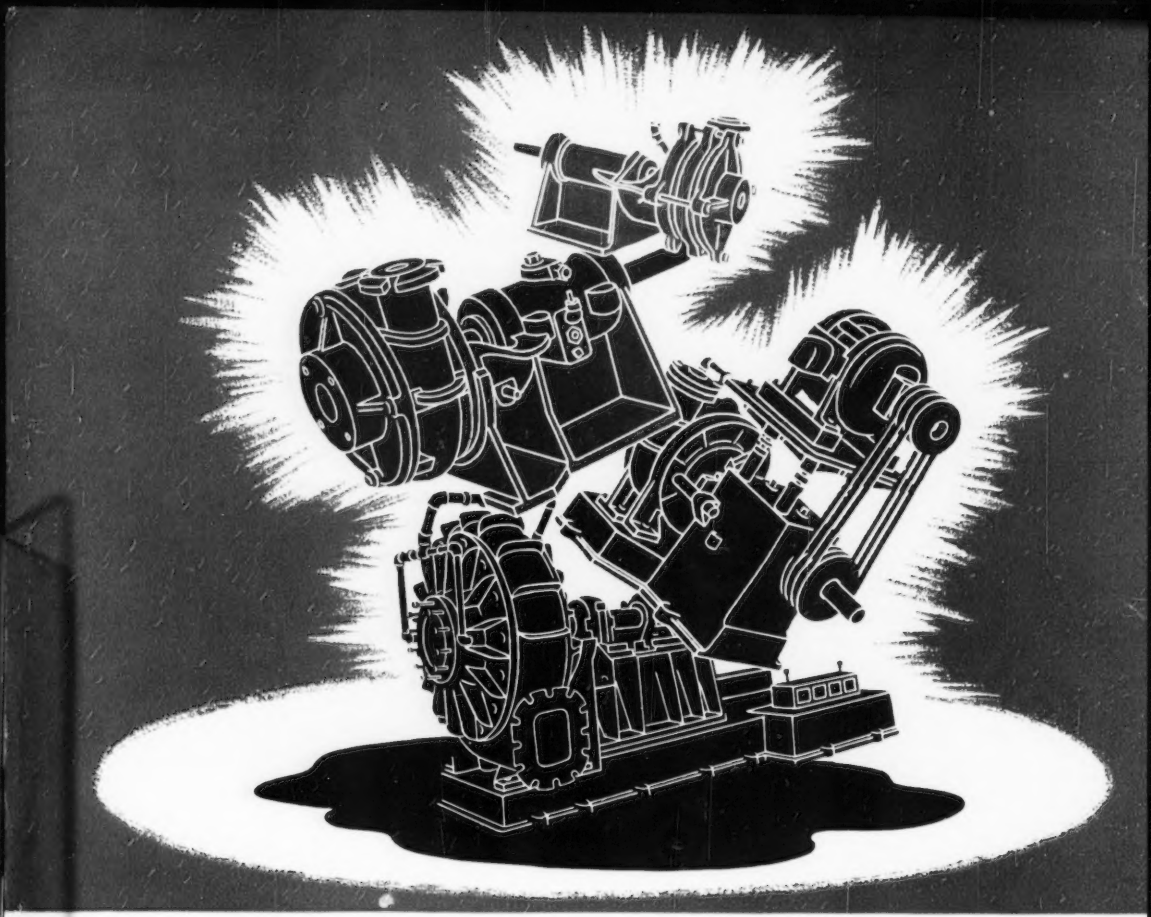
A McGRAW-HILL PUBLICATION

MARCH 1950

FOUNDED 1866



YOUR HELP IS NEEDED NOW... SEE PAGE 56



THE 12 PLUS-VALUES

IN ABRASIVE MATERIALS PUMPING

Yes, for handling almost any kind of abrasive materials, you get many extra-values in Hydroseal because it's a pump that's designed especially to solve special problems. Look over this list and see how many of these features meet your requirements.

After you've read them, you'll want to write for more information about Hydroseals. Better still, tell us what your pumping problem is, and we can recommend the system and kind of Hydroseal that can do your job. The Allen-Sherman-Hoff Co., 229 S. 15th Street, Philadelphia 2, Pa., U. S. A. Representatives in Most Principal Cities.

1—Wide range of sizes (10 g. p. m. to 12,000 g. p. m.)
2—Saves ⅓ to ½ in power costs
3—Handles filtrate or finest slurries at heavy concentration, up to 6" boulders
4—Abrasives bounce off Maximix Rubber parts
5—2 in 1 drive design
6—All-weather pump—hot, cold, wet or dry
7—Maximix Rubber outlasts equivalent metal parts 4 to 6 times
8—Discharge can be vertical, horizontal, right or left
9—Easy changeover for handling different materials or changing volume
10—Lowest cost materials handling method
11—Low cost maintenance
12—Hydroseals are part of a "pumping system" engineered specifically for your requirements

HYDROSEAL

SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

Now CARSET JACKBITS give even better performance

. . . with this new attachment developed exclusively for use with tungsten carbide bits

(Series 100 Carset Jackbits)

The experience gained in the field with hundreds of thousands of Carset Jackbits, has enabled Ingersoll-Rand engineers to develop an attachment that matches the revolutionary performance and long life of Carset Jackbits. It is the only attachment now available designed primarily for use with tungsten carbide bits.

This new attachment incorporates a patented 38-degree reverse buttress thread. After exhaustive tests, it was selected as the best design to cushion and absorb the destructive reciprocating and rotational forces that tend to wear bit threads or break the threaded extensions on drill rods.

In addition, the attachment permits appreciably more metal in the skirt walls of Carset Jackbits which greatly increases their body strength. This added metal makes the strongest possible bits. This is particularly important in small bit sizes.

In short, even greater economies are now possible from Carset Jackbits. This new attachment is designed to give trouble-free service for the life of the bit.

The Ingersoll-Rand Series 100 attachment is offered in four sizes and covers bit gauges from 1⅜ inches to 3 inches. It is easy to make this attachment...upset the drill rods on a sharpener and form the threads on an engine lathe or a Toledo threading machine. Write today for full information to Ingersoll-Rand Company, New York, or any of our 27 domestic branches.

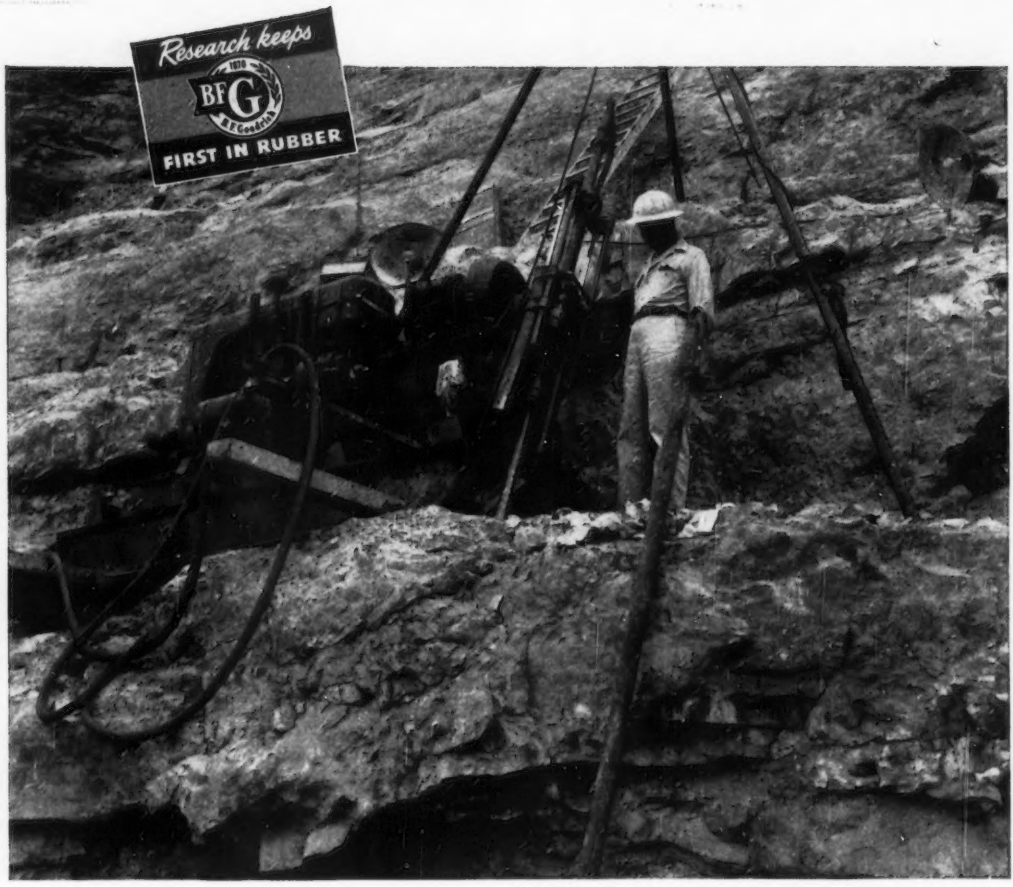
CARSET JACKBIT

SET WITH CARBOLOY INSERTS

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 409-15

ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • OIL & GAS ENGINES



Oil won't rot it, rock won't tear it
B. F. Goodrich air hose lasts for years

THAT's B. F. Goodrich Type 50 air hose at left, used exclusively on this big construction job at Bull Shoals Dam in Arkansas. Here's why—

Oil-resisting—Oil destroys ordinary rubber; particles of the tube come loose, choke up tube and drill. B. F. Goodrich Type 50 air hose has an oil-resisting tube that won't break into loose, gummy particles. On jobs where, with hose of ordinary rubber, the hose had to be replaced every few weeks to save tools, B. F. Goodrich air hose lasted for years. The cover of Type 50 is oil-resisting too. Workers with oily hands or gloves can handle it, use it near oily machines and surfaces.

Tear-resisting—On a quarry job like this, hose is always in danger of costly tears, breaks, snags. B. F. Goodrich engineers developed a special abrasion-resisting cover for air hose. Scraping over rock, rough floors, cinders, roads won't tear it. Won't check or crack from constant sunlight.

Recommended Services—B. F. Goodrich Type 50 air hose is recommended for shop tools, tie tamping, light and heavy portable compressors, air hoists, ore mining and quarry service.

B. F. Goodrich makes an air hose for every purpose, from small shop tool to big construction machinery . . . for small oil and air lines, heavy duty service in mines and quarries, for inside shops where oily conditions would rot ordinary hose, outdoor compressor service, air drills and pneumatic tools.

Your local BFG distributor has all the details and prices on these and other B. F. Goodrich air hose, many with features found only in hose made by B. F. Goodrich. Give him a call, or write *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Air Hose
BY
B.F.Goodrich

ENGINEERING AND MINING JOURNAL

84th YEAR OF PUBLICATION

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Company Offices: Publication office: 210 S. Desplaines St., Chicago 6, Ill. Editorial and Executive Offices: 330 West 42nd St., New York 18, N. Y. Cable address: McGraw-Hill, New York. Branch Offices: San Francisco 4, 68 Post St.; Chicago 11, 520 N. Michigan Ave.; Los Angeles 14, Pacific Finance Bldg.; Washington, D. C., National Press Bldg.; Pittsburgh 22, 739-9 Oliver Bldg.; Detroit 26, 2980 Penobscot Bldg.; Cleveland 15, 1510 Hanna Bldg.; Boston 16, 1427 Statler Bldg.; Philadelphia 3, 17th and Santom Sts.; Atlanta 3, 1911 Rhodes-Haverty Bldg.; St. Louis 8, Continental Bldg. District Managers: New York, T. E. Alcorn, F. W. Roets; Philadelphia, W. A. Potter; Cleveland, W. M. Spears; Pittsburgh, H. C. Chellson; Chicago, C. J. Coash and G. A. Mack; San Francisco, J. W. Otterson; Atlanta, R. C. Maultsby; Los Angeles, C. W. Dysinger. London address: McGraw-Hill Publishing Co. Ltd., Aldwych House, Aldwych, London, W.C. 2, England. Cable address: McGraw-Hill, London. Other McGraw-Hill foreign news offices in Paris, Berlin, Moscow, Prague, Shanghai, Bombay and Mexico City.

A McGRAW-HILL PUBLICATION

Subscription Information: ENGINEERING AND MINING JOURNAL, March, 1950, Vol. 151, No. 3. Published monthly at Chicago, Ill. Return postage guaranteed. Subscription rates: United States and possessions $3 a year, $4 for 2 years, $5 for 3 years. Canada $5 a year, $8 for 2 years, $10 for 3 years. Pan American countries $5 a year, $8 for 2 years, $10 for 3 years. Elsewhere $15 a year, $25 for 2 years, $30 for 3 years. Please indicate position and company connection in all subscription orders. Price of this issue, 50 cents. Entered as second class matter August 16, 1948, at the post office at Chicago, under the Act of March 3, 1879.

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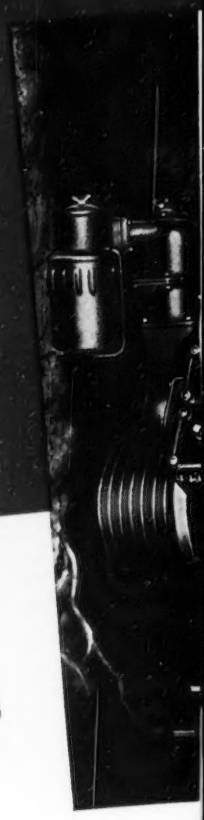
REDUCE COMPRESSOR MAINTENANCE COSTS . . .



Use the Texaco air compressor oils exactly suited to your particular operating conditions

TO RUN your air compressors at top efficiency and bring your maintenance costs down, select lubricants to meet the specific operating conditions. You can do this with Texaco because there is *a complete line* of Texaco air compressor oils to meet every need.

For example, if conditions are normal, your Texaco Lubrication Engineer will recommend Texaco straight mineral oils; but if excess moisture is present, he will suggest a Texaco compounded oil. Then for rust prevention, there are special Texaco rust-inhibited oils . . . and for very heavy service, or where carbon and gum formation are problems, Texaco heavy-duty oils should be used.

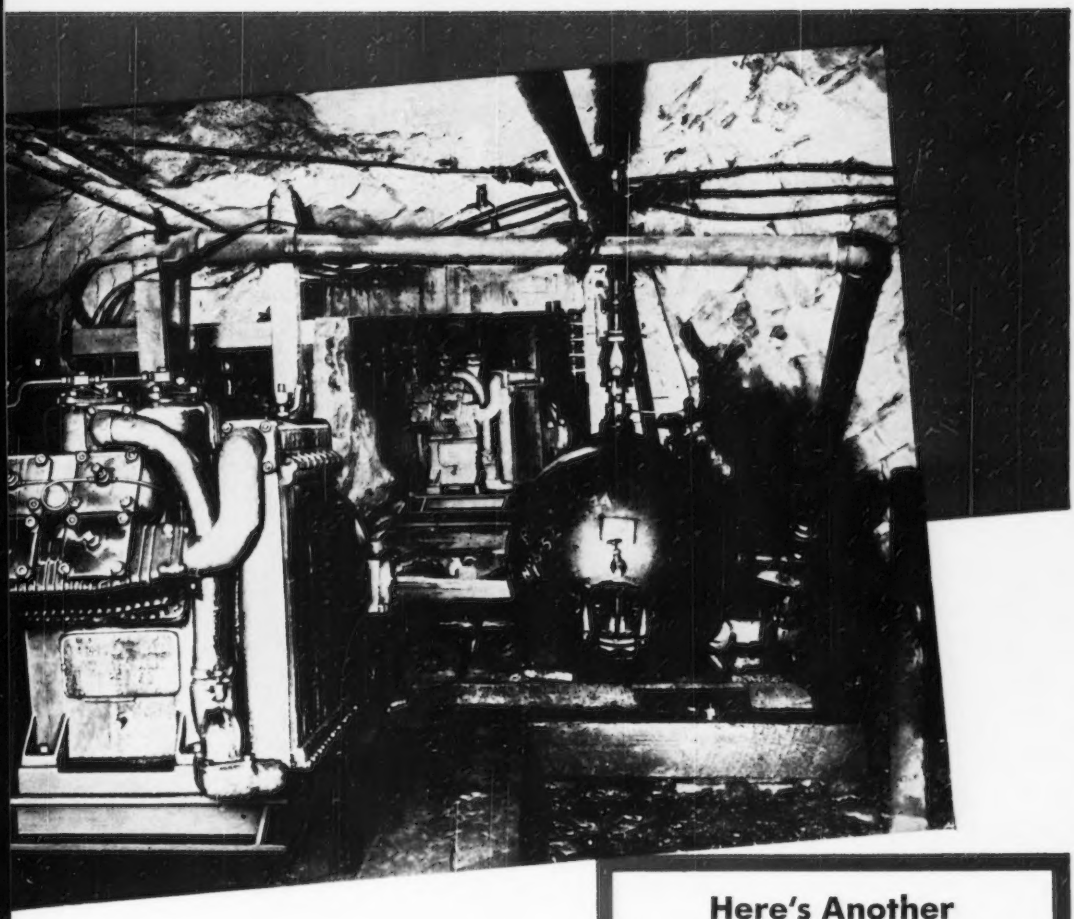
Use of the *right* Texaco air compressor oils assures smooth, trouble-free operation and reduces wear. Your compressors will run with free rings, cleaner valves, open ports . . . air lines will stay clear.

Texaco Products have proved highly effec-

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

TEXACO

TEXACO



tive in increasing efficiency and lowering costs in mines everywhere. That is why, for example, *more copper mining equipment in the U. S. is lubricated with Texaco than with any other brand.*

Get the full story from your Texaco Lubrication Engineer. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write:

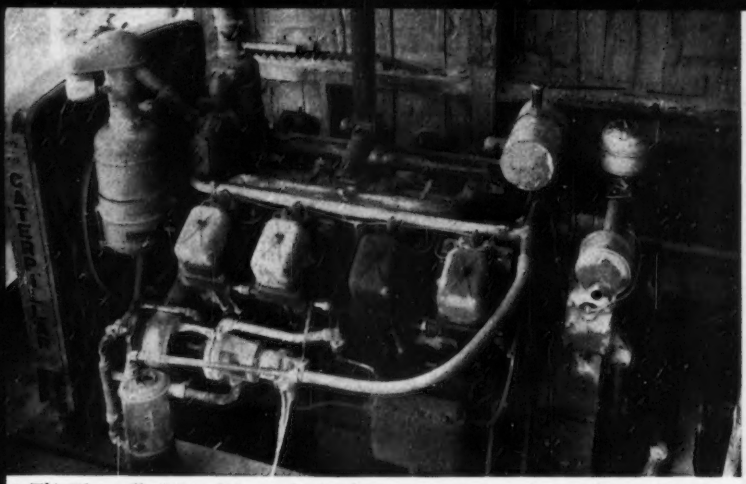
The Texas Company, 135 East 42nd Street, New York 17, New York.

Here's Another Texaco Economy

You'll drill greater footage at lower cost when you lubricate drills with *Texaco Rock Drill Lubricants EP.* These are "extreme pressure" lubricants . . . designed to assure full protection against wear, to guard against rust, and to prolong drill life.

Lubricants and Fuels

FOR THE MINING INDUSTRY



↑ *This "Caterpillar" Diesel D17000 Engine drives the crusher, while three other "Cat" Diesels power the conveyors, compressors and generator.*

Miners at work in the Sierra Magnesite mine. All drilling is done with air supplied by "Caterpillar"-powered compressors. ↓

ALL-

CATERPILLAR

REG. U. S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS

"CATERPILLAR" MINE TEAM

Supt. H. J. Tillia, Sierra Magnesite Co., Gabbs, Nevada, believes in standardizing on the best—"Caterpillar."

THE Sierra Magnesite Co., Gabbs, Nevada, has proved it pays to standardize on one dependable make of engine. Four husky "Caterpillar" Diesels power every operation in the mine. They're backed by one manufacturer, serviced by one dealer.

Says Superintendent H. J. Tillia: "We find 'Caterpillar' equipment lives up to its advertising. There's nothing like it for power, dependability and low operating cost. When you need power you can always count on these engines. And they sure can take a beating."

You can't *talk* quality into a product. You've got to *build* it in. It's the built-in stamina of "Caterpillar" Diesels that gives them their low maintenance cost and long, trouble-free work life.

Your "Caterpillar" dealer has the right engine for *your* job—and the parts and service facilities to keep it working and earning you profits long after it's paid for itself. See him today, or send the coupon.

CATERPILLAR TRACTOR CO., Peoria, Illinois

LOOK UNDER THE HIDE

Subject to thrust and shock, crankshafts must be rugged. "Caterpillar" crankshafts are superior quality steel forgings, accurately machined and balanced. Main bearings are on each side of crankpin journals. Large-radius fillets reduce stress concentrations while end thrust is absorbed on polished thrust surfaces. "Hi-Electro" hardened for maximum service life and Superfinished to within five-millionths of an inch of true surface smoothness, these crankshafts are tops in design and craftsmanship. Look under the hide for quality.

DIESEL

EARTHMOVING EQUIPMENT

CATERPILLAR TRACTOR CO.
BOX EM-3, PEORIA, ILLINOIS

Please send me your free informative booklet, "Engine and Electric Set Specification Sheets."

Name _____

Address _____

Save on original costs

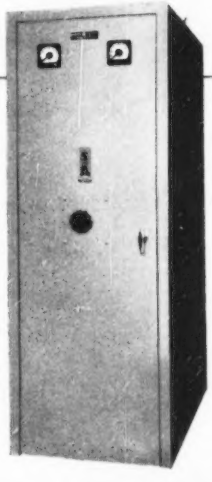
use G-E synchronous

You'll save money in many applications when you specify General Electric synchronous motors. The chart shows (ratings above the black line) the applications where synchronous motors (including control and exciter) have a lower first cost than any other kind of motor. And even in cases where there is no original saving (between red and black lines) you can save on over-all cost by specifying synchronous motors to increase operating efficiency and improve power factor.

When you specify G-E synchronous motors, you get application engineering by experts in the electrical problems of *your* industry. You get the motor that gives you greatest return on your investment.

For your next large, constant-speed motor, ask your General Electric sales representative to tell you how you can take full advantage of the money-saving features of G-E synchronous motors. Or write for bulletins on your letterhead to *Section 770-17, Apparatus Dept., General Electric Co., Schenectady 5, N.Y.*

Low speed..GEA-5332 **High speed..GEA-5426**
Control..GEC-505



PROTECT YOUR SAVINGS WITH G-E SYNCHRONOUS MOTOR CONTROL

New rotor field circuit provides accurate field application—motor is protected against starting shock.

New rotor field circuit keeps constant check on motor performance and, on pull-out, field is removed before first slip cycle is completed—to protect against electrical and mechanical damage.

In addition to the protection offered by the new rotor field circuit, the **new, smaller air-break Limitamp controller** provides fast-acting EJ-2 Fuses that limit short circuits to less than one-half cycle for motors up to 5000 volts.

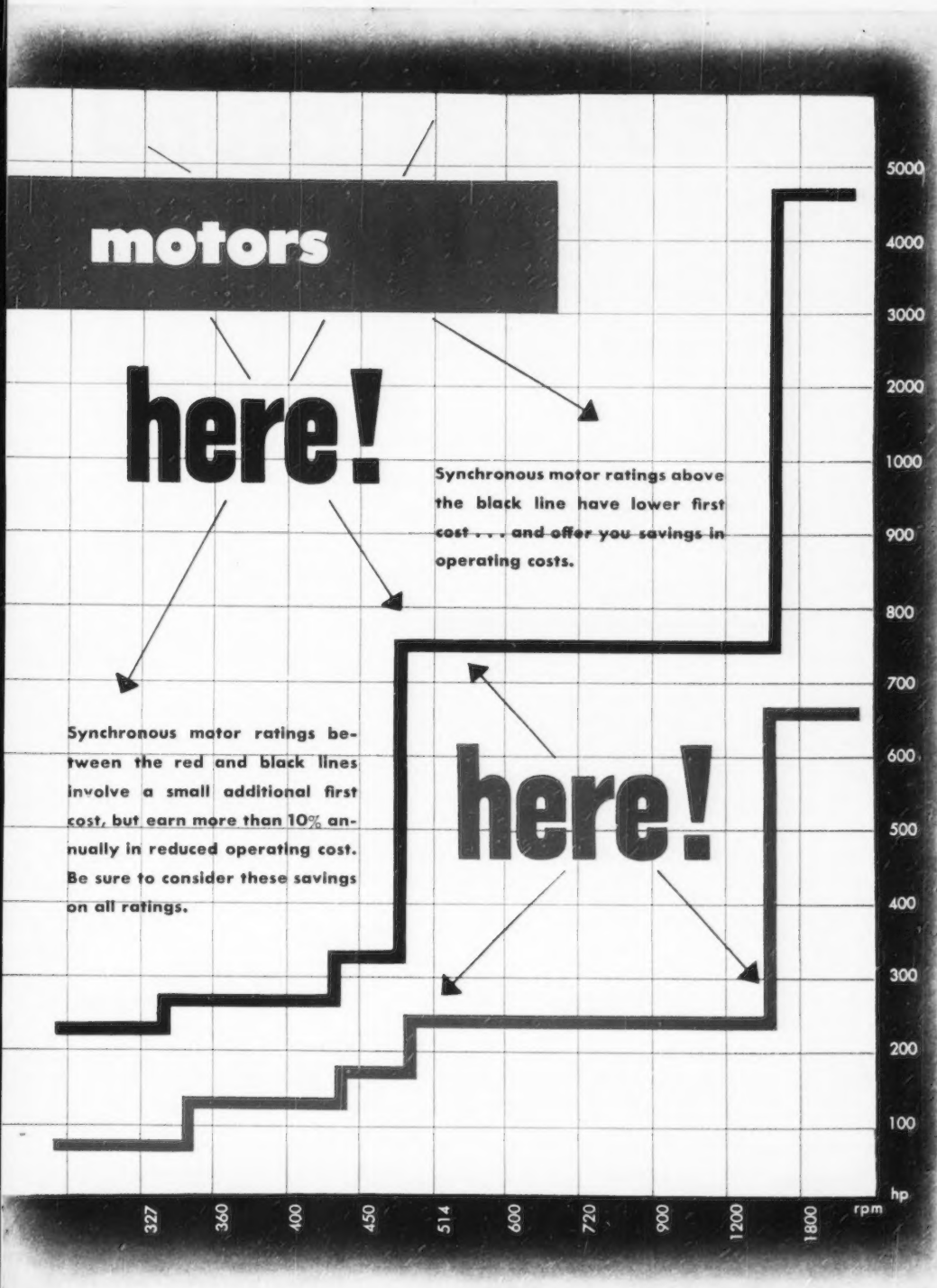
Low-voltage motors (up to 600 volts) are protected by compact, easily inspected air-circuit breakers.

To make it easier to install, to adjust, to operate, and to service, G-E synchronous control is factory-mounted in a steel enclosure with anti-glare meters and all the built-in accessories required for your application.

Come to General Electric for the engineering and manufacturing that will assure you of adequate protection of your motor and plant investment. Write for more information on this precise motor control.

GENERAL ELECTRIC

770-17


motors
here!
Synchronous motor ratings above the black line have lower first cost . . . and offer you savings in operating costs.
Synchronous motor ratings between the red and black lines involve a small additional first cost, but earn more than 10% annually in reduced operating cost. Be sure to consider these savings on all ratings.
here!
5000
4000
3000
2000
1000
900
800
700
600
500
400
300
200
100
hp
327
360
400
450
514
600
720
900
1200
1800
rpm

"C" TOURNAPULL..

gives you year-round EARNINGS

C Tournapull prime mover . . . 190 h.p. diesel . . . 5 speeds to 30 m.p.h. . . . 21.00 x 25 low-pressure tires . . power steer, 90° turns . . . electric controls . . . uses 4-wheel multi-disc air brakes, braking surface 4,176 sq. in.

No other dirt mover can offer you the opportunities for steady earnings that come to you with C Tournapull. Behind this high-speed, rubber-tired prime mover you can interchange at will six different types of equipment to keep working and earning all year-round. Each fits specific needs for earning extra profits on stripping, hauling, lifting and materials-handling around your property.

Note that each of these auxiliary interchangeable units is a simple, rugged, specialized tool for doing certain types of work at a far lower cost than is customary with general purpose equipment. When you buy any one combination with the C Tournapull prime mover you get with it an extra value in insurance of steady and profitable earnings, because of its great versatility of application with other hauled units.

Tournapull, Tournacrane, Tournamixer-Trademark Reg. U. S. Pat. Off. Tournarocker, Tournashopper-Trademark C.127 M.

LET

To: R. G. LeTOURNEAU, INC., Peoria, Illinois

Please send information on C Tournapull prime mover for work with:

☐ Scraper ☐ Rear-dump hauler ☐ Bottom-dump hauler ☐ Flat bed ☐ Crane ☐ Concrete Mixer

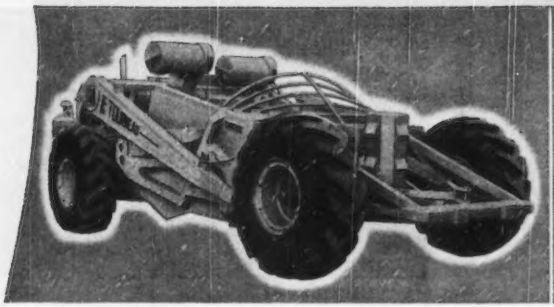
NAME..... TITLE.....

COMPANY..... TYPE OF OPERATION.....

STREET..... CITY, STATE.....

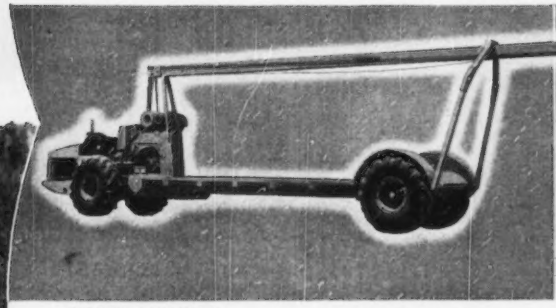
If you have work to subcontract for any of tools shown, please describe fully in letter and we will have your local LeTourneau Distributor put you in touch with nearest owner equipped to handle your work.

.interchangeability

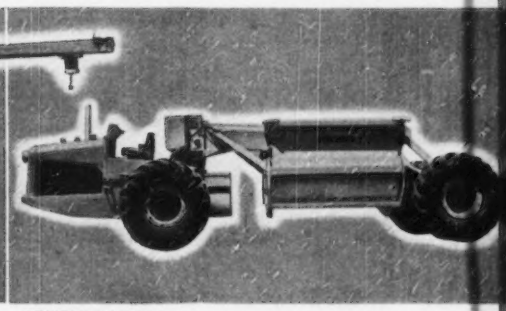


TOURNAPULL . . . C Roadster loads 13.5 cubic yards (capacity 16 tons). In any kind of scraper dirt on either long or short hauls, will beat all previous LeTourneau Scrapers in this size range for both output-per-day and cost-per-yard. Optional hauled units, bought as needed, cost $4500 to $7400, prime mover change takes only a few hours.

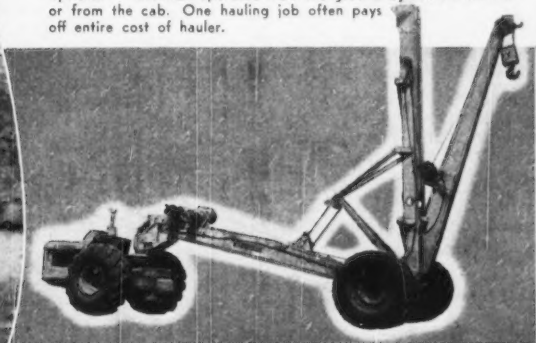
TOURNAROCKER . . . a revolutionary new rear-dump haul unit for use under shovel, dragline, conveyor or other loading equipment. Capacity 16 tons or 16.5 yards heaped. Big shovel target, 7' 10½" x 11' 2" . . . 15' 11" wheelbase. Simple electric body hoist. Dumps clear over bank, tips vertical to clean fast. Turning radius 90° or 12½'.



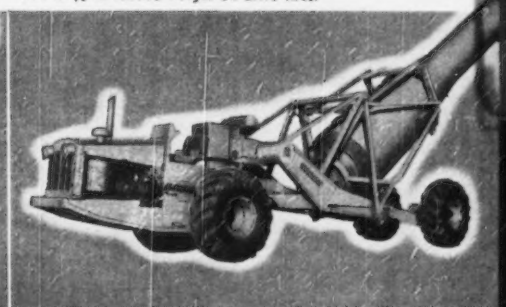
TOURNAHAULER . . . 20-ton flat-bed can take heavy mining equipment and supplies on or off highways or cross country. Traveling overhead monorail car with 5, 10 or 15-ton electric hoist optional — one-man operated from the ground by remote control or from the cab. One hauling job often pays [illegible] off entire cost of hauler.



TOURNAHOPPER . . . bottom-dump hauler . . . 15-yards heaped, 16-ton capacity. Tournamatic differential, giant tires, and high clearance take it through muck and gumbo. Easy loading . . . top opening 8' x 8'. Easy to drive over windrows, clamshell-type dump-doors lift clear, give 22" clearance open. Turn radius 14'. 51% of loaded weight on drive tires.



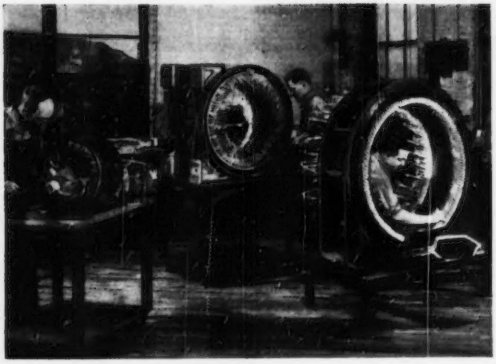
TOURNACRANE . . . capacity, 15 tons with full maneuverability and travel with maximum loading. Maximum lift 35', reach 35'. Sliding boom on tilting track gives unique load maneuverability for structural repair and erection. Individual electric motors control each function independently. Reaches into "impossible" places . . . goes anywhere through sand, mud or gumbo.

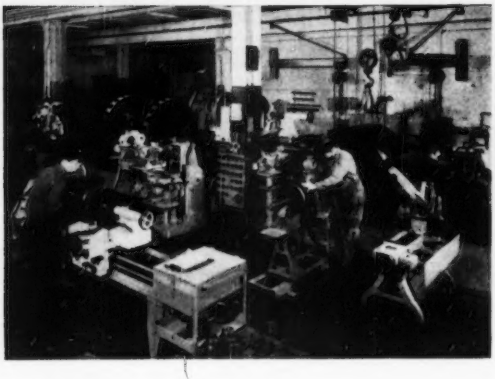


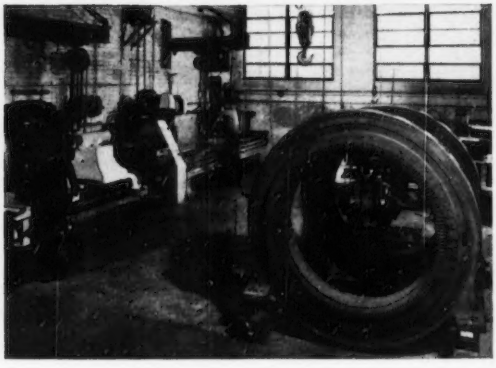
TOURNAMIXER . . . transit-mix unit of 6 or 7 yards capacity ready to go anywhere on or off highway. Mixing speed 7 to 10 r.p.m. Two discharge speeds — 7 to 20 r.p.m. No need for chutes or elevators, Tournamixer dumps directly into forms at horizontal distance of 10' 7" back of wheels or at elevations from 4' 10" to 20' 8". All electric control from driver's seat.

LETOURNEAU PEORIA, ILLINOIS — JOB-PROVED Over $300 Built and Shipped — **TOURNAPULLS**

MORE YARDS PER HOUR WITH RUBBER-TIRED POWER







For Any Size Motors

DEPEND ON REPAIR SERVICE LIKE THIS!

Example: a Midwest Utility recently burned out a vital 75 hp motor. They called Chicago Electric, their nearby A-C Certified Service Shop, at 11:00 a.m. At 4:00 p.m. the *same day*, Chicago Electric had the unit repaired and back in service! Total time: 5 hours.

WHEREVER YOU ARE, you can get quick, dependable service from your nearby A-C Certified Service Shop, for there are over 75 such shops in all major industrial areas.

These shops have been selected on the basis of, **1)** quality of their work, **2)** facilities, and **3)** their community reputation. They maintain experienced personnel and use factory parts or parts of equal quality. They can be relied on for good work at honest prices.

When you need this kind of repair service on motors, controls or transformers, call your nearest Allis-Chalmers Certified Service Shop.

Need New Motors Or Starters?

For motors from one hp up to the largest sizes — with Allis-Chalmers controls to match — call your nearby A-C Dealer or Sales Office.

A-2949

ALLIS-CHALMERS, 969A SO. 70 ST. MILWAUKEE, WIS.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS

At Bagdad

...where the rock is Tough...

Are You Modernizing or Replacing Equipment?

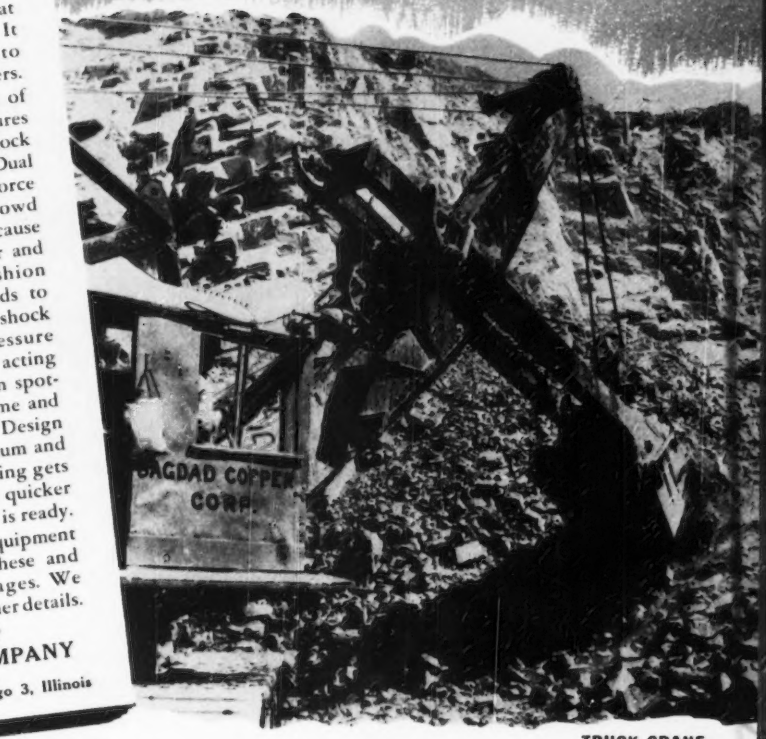
Investigate NORTHWEST SHOVELS • CRANES and DRAGLINES

Here is the Northwest in the pit at Bagdad Copper Corp. in Arizona. It handles the ore, loading out to wagons for hauling to the pit crushers.

Look at that rock! Here's one of the many places where the features that make the Northwest a real Rock Shovel count. The Northwest Dual Independent Crowd utilizes a force wasted on other independent crowd shovels. Northwests load fast because they load with plenty of power and without stuttering. The Cushion Clutch reduces shock overloads to parts under power before the shock hits machinery. Uniform Pressure Swing Clutches are smooth acting and assure greater accuracy in spotting loads for less waste of time and less spillage. Simplicity of Design reduces upkeep to the minimum and Northwest Differential Steering gets the machine out of the way quicker on a bad floor when the shot is ready.

If you are planning new equipment you should know about these and other Northwest advantages. We will be glad to give you further details.

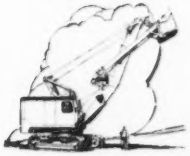
NORTHWEST ENGINEERING COMPANY
1509 Field Bldg.
135 South LaSalle St., Chicago 3, Illinois



CRANE

A crawler crane you can rely on. A size for every job.

SHOVEL



Northwest shovels have been proved in mining work.

DRAGLINE

The Model 95 is a real stripper. Fast all around. Other draglines in sizes for every job.

TRUCK CRANE

Here is the rubber tired unit for those varied jobs around the plant.

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

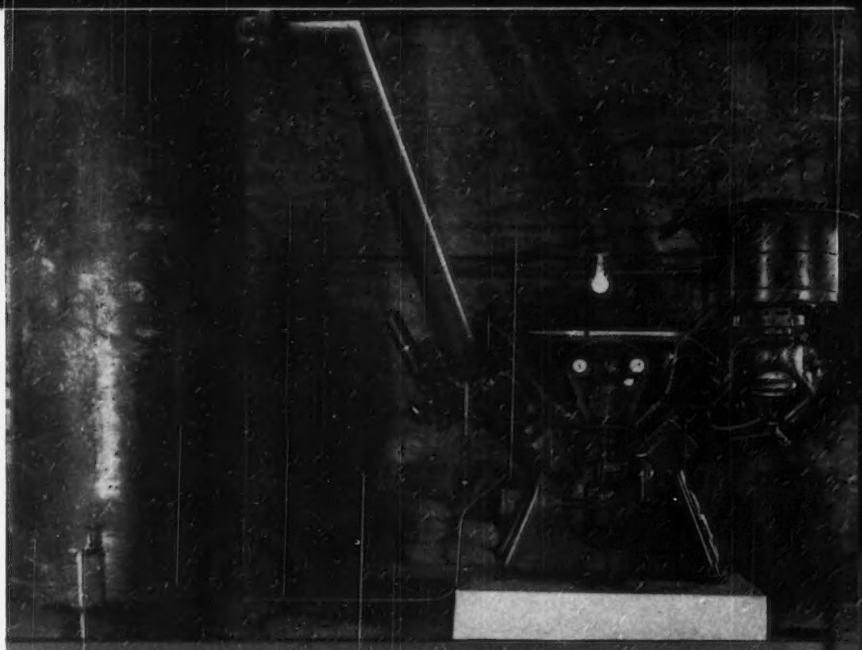
JOY
COMPRESSORS

HANDLE YOUR MINING NEEDS AT LOWEST COST OVER THE LONG PULL!

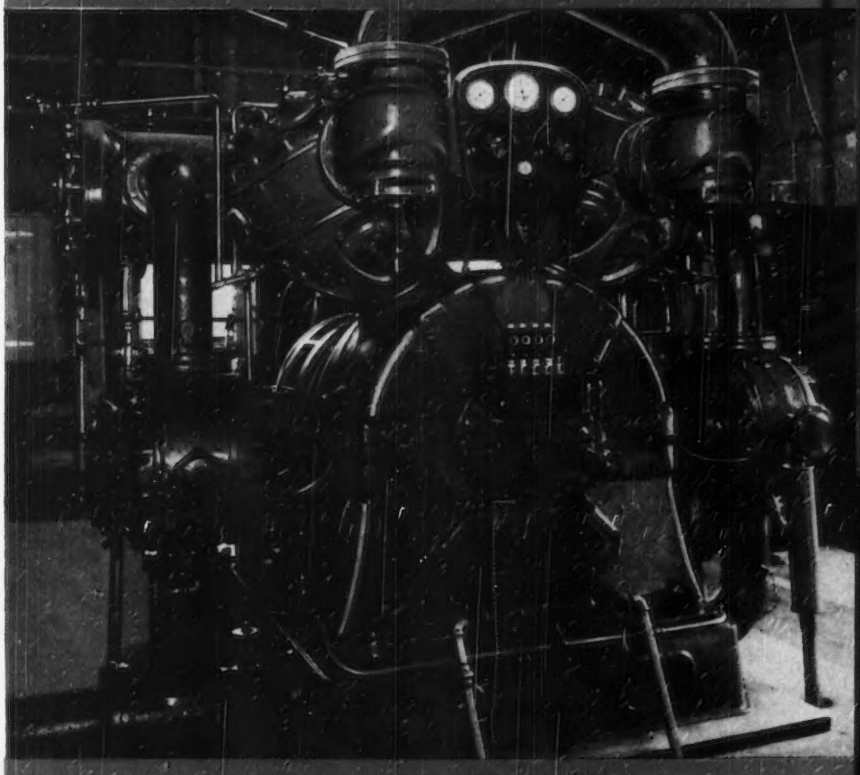
LET US PROVE THESE SUPERIORITIES OF JOY STATIONARY COMPRESSORS!

- ★ **Require less room—Cost less to install**
- ★ **Exclusive DUAL-CUSHION VALVES—more efficient and durable in service**
- ★ **Exclusive LOAD CONTROL—lower operating cost**
- ★ **Simpler Design—Longer Life—Less Maintenance**

JOY WN-112, two cylinder, two stage, double acting, is a heavy duty, continuous type compressor, built in capacities from 368 to 1828 CFM, and up to 3656 CFM as twin units.



JOY WN-114 in various sizes delivers from 1092 to 3656 CFM, and up to 7312 CFM in twin units. It's a heavy duty, continuous type four cylinder unit; two stage, double acting.



Write for Bulletins, or

Consult a Joy Engineer

W&D M 2828

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

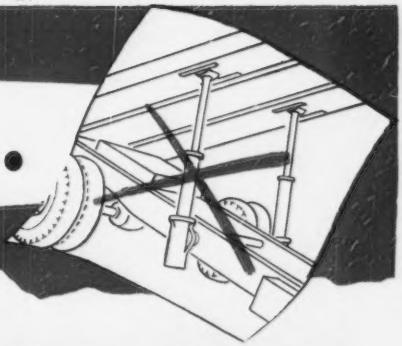
NO BODY-HOIST

Team DUMPTORS with KOEHRING EXCAVATORS for lowest costs . . .

Koehring's "complete package" of heavy-duty excavators and Dumptors offers you consistent savings on both excavating and hauling. 4 rugged sizes assure top output in every shovel class: ½-yard 205, and ¾-yard 304 (illustrated), available on crawlers or rubber . . . big 1½-yard 605 and 2½-yard 1005. It pays to standardize on Koehring.

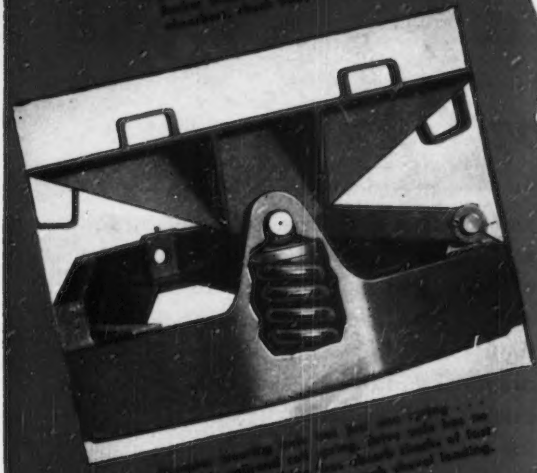
KOEHRING HEAVY DUTY

MAINTENANCE....



KOEHRING DUMPTORS

haul more yards per shift at less cost per yard because they have no slow-working body hoists. Operator trips release lever and gravity dumps the load in 1 second. There are no hoist maintenance delays . . . no hoist replacement parts to eat into work-time or profits. Koehring gravity dump is instantaneous and trouble-free in all temperature extremes . . . never balks . . . never wears out.



NO COSTLY SPRING MAINTENANCE...

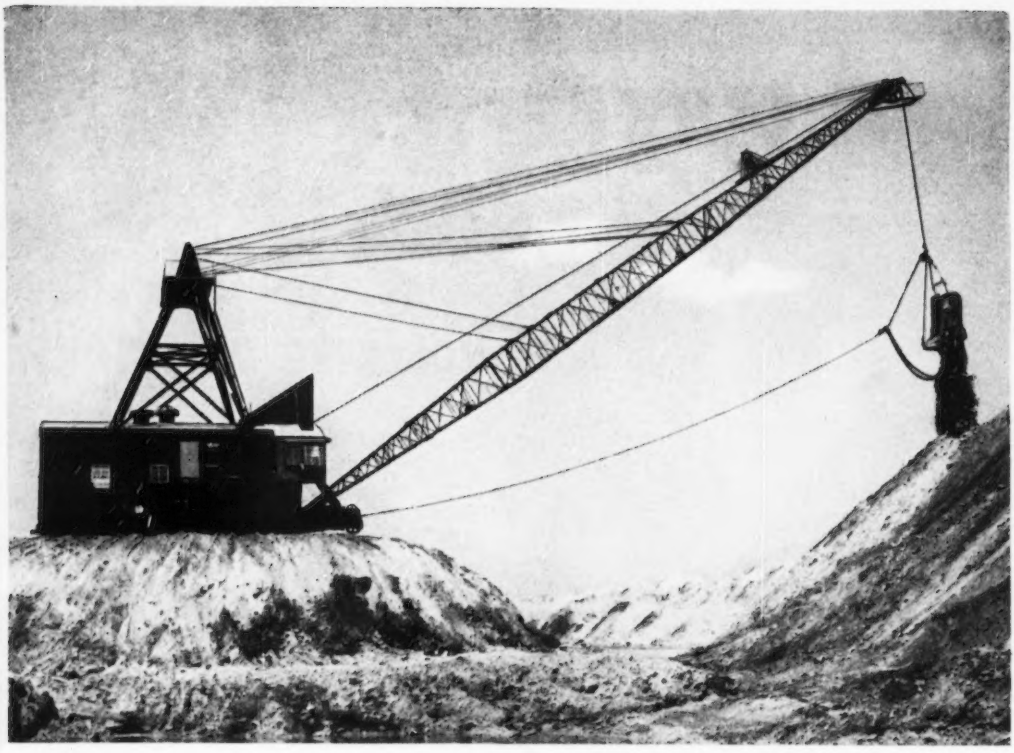
You also save spring maintenance time and spring replacement costs because heavy-duty Dumptors have only one big double-coil chassis spring, on the steering axle. That's all . . . none on the drive axle. Big, shock-absorbing 16.00 x 24 tires eliminate need for more.

Add up all *your* body hoist and spring maintenance costs for a year . . . see how much you'll save with Koehring heavy-duty Dumptors. Find out, too, how Dumptor's no-turn shuttle haul . . . constant-mesh transmission . . . and 3-speed travel forward and reverse, can increase *your* production and profits. See your local Koehring distributor *today!*

DUMPTOR-Trademark Reg. U. S. Pat. Off. K907

KOEHRING COMPANY
Milwaukee 10, Wis.

SUBSIDIARIES: PARSONS • JOHNSON • KWIK-MIX



An Appetite for Overburden

Where overburden is the problem, the answer is a Bucyrus-Erie walking dragline like the 7 to 10 cubic yard 9-W pictured above . . . for Bucyrus-Eries offer a line-up of job-proved features that mean big output wherever they go to work. Simple, sturdy design and construction mean reliable operation — important when working far from repair facilities. A dependable, strong walking mechanism means exceptional maneuverability, a smooth walking action without jerks or shocks — so Bucyrus-Eries can always work in the most effective digging and dumping positions, can move safely and surely over loose sand, soft ground, around obstacles. Long ranges and fast operating cycles mean big yardage capacities — the "appetite for overburden" that spells profitable operation. Bucyrus-Erie walking draglines are offered in a wide variety of bucket sizes and boom lengths to fit your job requirements.

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

55 Allis-Chalmers Tractors and Motor Graders

SETTING SERVICE RECORD

for

PETER KIEWIT SONS' CO.

and

MORRISON-KNUDSEN CO.

on their 18½-million-yard Garrison Dam job in North Dakota, World's Largest Rolled-Earth Fill Dam.

42 HD-19 Hydraulic Torque Converter Tractors

12 Model AD Motor Graders

Model HD-5 and Tracto-Shovel

Fleets of A-C's have set a terrific pace since early in 1949 on this 20-hour-a-day, six-day-a-week job. Production during good weather hit 100,000 yards and more a day! YET DOWNTIME HAS BEEN MUCH LESS THAN THE CONTRACTORS ANTICIPATED — based on previous earth-moving experience.

This outstanding service record again demonstrates that A-C equipment is built to take it. Proves again that extra production time is gained through such advantages as simplified adjustments and repairs ... electric starting ... quick, easy removal of major assemblies ... interchangeability of many GM engine parts on all makes and models of A-C diesel tractors and motor graders. PLUS extended lubricating periods — 1,000 hours on truck wheels, idlers and support rollers.

For more production, for less upkeep, think of Allis-Chalmers when you think of road-building equipment.

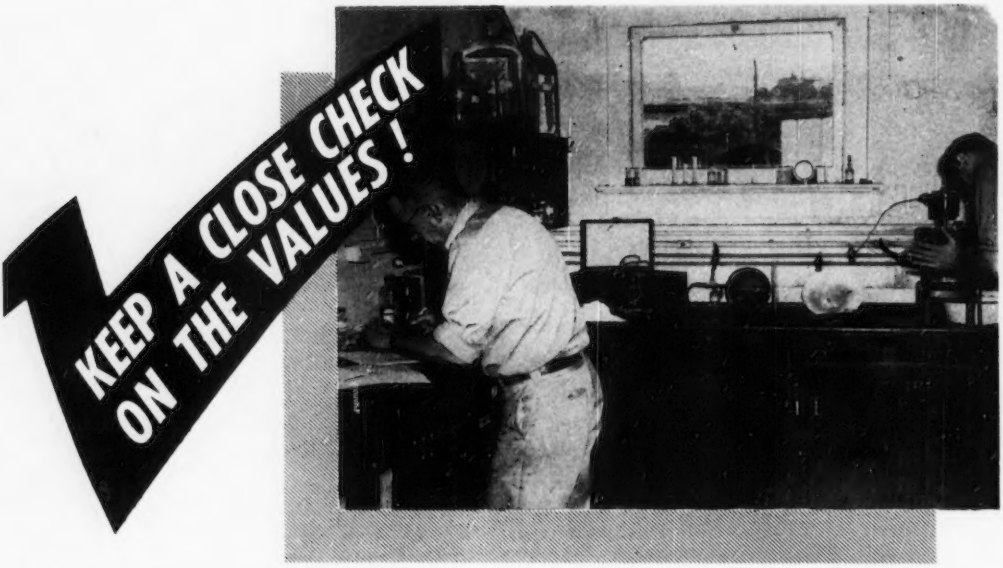
"SEEING IS BELIEVING"

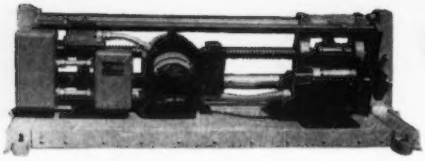
Ask your Allis-Chalmers Dealer for a demonstration

ALLIS-CHALMERS

TRACTOR DIVISION · MILWAUKEE 1, U. S. A.

... Originator of the Torque Converter Tractor





Geary-Jennings Sampler
does it
on a world-wide scale!

- ***Entirely automatic***
- ***Tightly shielded from dirt or tampering***
- ***Equipped with explosion-proof and fire-proof controls upon request***
- ***Easily installed on any conveyor system***
- ***Samples wet or dry material***

It has required many years of close collaboration between Galigher engineers and practical mill men to develop and apply the unique GEARY-JENNINGS sampling principle through a rugged, safeguarded machine—a machine that yields true value findings on a world-wide scale. It belongs in every plant where a continuous close-check on values is a key to successful operation. GEARY-JENNINGS Sampling can be readily adapted to: ores, mill pulp, scrap metal, corn grits, coal, potash, textiles, cement and phosphates, etc.

Write for full details on how the GEARY-JENNINGS Sampler can be specifically and readily adapted to your sampling program.

"Leaders in Experience and Service"

THE GALIGHER COMPANY

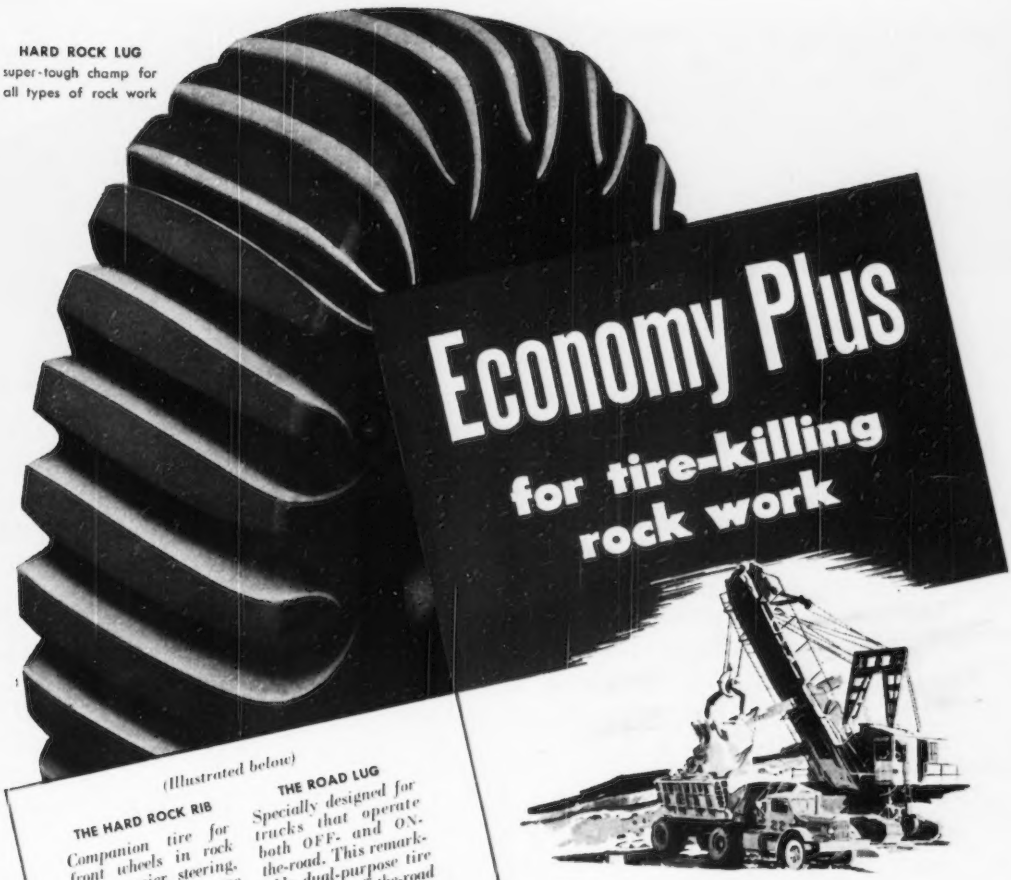
METALLURGICAL DIVISION ENGINEERING SERVICE

CONCENTRATION • ORE TESTING • PLANT DESIGN • CONSTRUCTION

HOME OFFICE
SALT LAKE CITY, UTAH

EASTERN OFFICE
921 BERGEN AVENUE
JERSEY CITY,
NEW JERSEY

AGENTS IN ALL PRINCIPAL FOREIGN MINING DISTRICTS



Economy Plus

for tire-killing rock work

(Illustrated below)

THE HARD ROCK RIB

Companion tire for front wheels in rock work—easier steering, smooth rolling, same cord body, same shoulder and sidewall as the Hard Rock Lug.

THE ROAD LUG

Specially designed for trucks that operate both OFF- and ON-the-road. This remarkable dual-purpose tire combines off-the-road toughness and traction with on-the-road mileage and economy.

We think you'll like
"THE GREATEST STORY EVER TOLD"
Every Sunday—ABC Network

GOODYEAR's Hard Rock Lug is specially designed inside and out to give longest tire life plus greatest tire economy on the toughest jobs going.

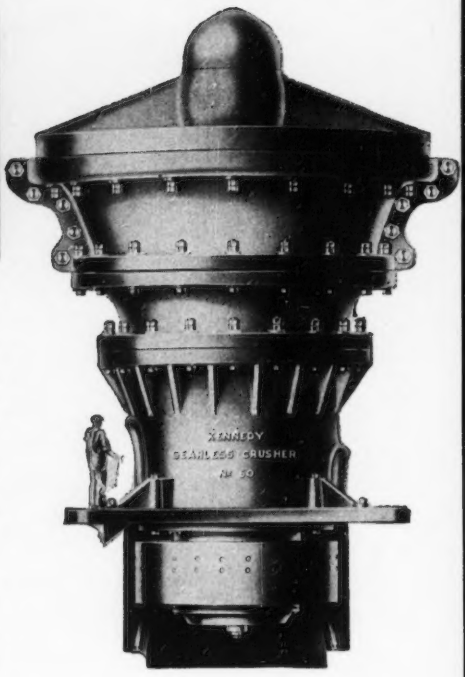
Check these features and you'll know why: extra-tough carcass—extra-thick undertread to protect the carcass against bruising—big husky lug bars to armor tread and sidewalls against cuts and rips—a self-cleaning tread that's tops for traction.

Save on your tire dollar, get better performance—get Goodyear's Hard Rock Lug. Remember, always BUY and SPECIFY Goodyear—*it pays!*

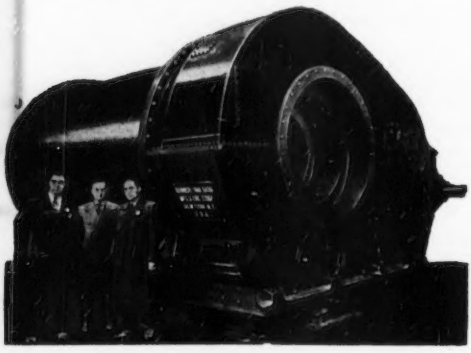
GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TIRES THAN ON ANY OTHER KIND

MORE CRUSHING FOR LESS POWER



When you use a "KVS" Gearless Crusher KINETIC ENERGY gives you ADDED FREE POWER for no added cost. That's the extra power that results when a big pulley or flywheel whirls around—remember the big pulley as pictured here on the old Corliss Engine? There's a BIG Pulley in the "KVS" Gearless! It whirls around at a speed of 3,500 ft. per minute—and what EXTRA crushing power you get! What's more, the 8-ton pulley (used in a "KVS" Gearless Crusher weighing 400,000 lbs.) whirls so easily you can turn it with TWO FINGERS! In short, more CRUSHING for LESS POWER COST (with much less vibration and much less NOISE, too), is the idea that puts "KVS" way out in front, and keeps it there!



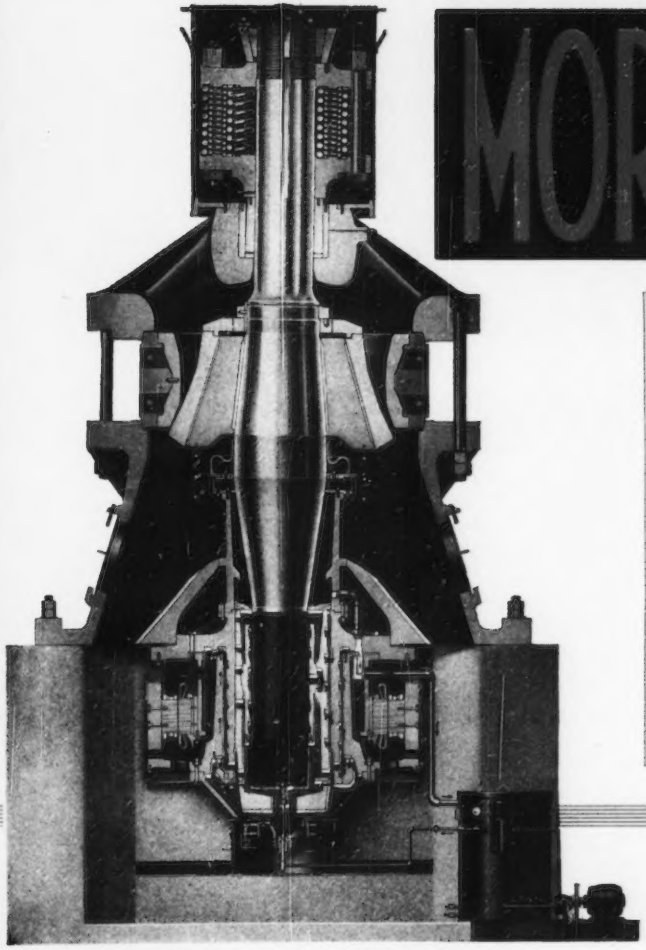
Save a young fortune on a synchronous motor!

Yes—you can save up to $6000 on a 10 ft. tube or ball mill if it's a "KVS" with integral gear drive. Why? Because the motor is DIRECT CONNECTED to driving shaft. Shaft is carried in roller bearings that CANNOT be misaligned or set wrong. The pinion shaft to which the motor is connected runs at approximately 600 r.p.m. while pinion shafts in other people's mills run at about 180 r.p.m. ON A 10 FT. KENNEDY MILL THIS ENABLES YOU TO PURCHASE THE SYNCHRONOUS MOTOR at a tremendous SAVING! What's more, "KVS" trunnions on large sized tube and ball mills are CARRIED ON OIL. Bearing never wears out, uses little power. All gears and bearings are automatically sprayed with oil before tube mill is started (Design patented). Believe it or not, in 15 years no "KVS" gears or pinions have worn out on this type mill.

MORE THAN $5000 SAVING

Kennedy-Van Saun
MANUFACTURING AND ENGINEERING CORPORATION
2 PARK AVE., NEW YORK 16, N. Y.
FACTORIES:
DANVILLE, PA., U.S.A.
CANADA, ENGLAND, FRANCE, AUSTRALIA

The



MORE PROOF OF TYPE "S" SUPERIOR PERFORMANCE

SPEAKING OF CRUSHING . . . .

LOCATION: NATIONALLY KNOWN MINING CO. IN NEW YORK STATE

CRUSHERS: FOUR NO. 37½ KENNEDY TYPE "S" ROLLER BEARING GYRATORY CRUSHERS

FEED OPENING: 6¼"; **DIAMETER OF HEAD:** 3 FEET

DISCHARGE SETTING: 7/32" CLOSED SIDE AT HEAD

CAPACITY EACH CRUSHER: 56 TONS PER HOUR

HORSEPOWER EACH CRUSHER: 48 HP.

CLOSED CIRCUIT OPERATION

GRADATION AS FOLLOWS:

THE FIGURES!

99.8%	Minus	3	MESH
93.3	"	4	"
80.6	"	6	"
66.6	"	8	"
56.1	"	10	"
48.1	"	14	"
40.6	"	20	"

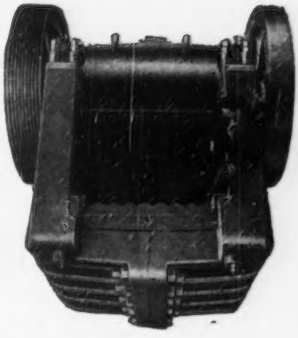
Can You Equal These Figures?

A "2-fisted" Swing Jaw Crusher!

MORE OUTPUT FROM EACH JAW

See? All 1 piece except jaw plates

It doesn't make sense—and you lose dollars—when all crushing load in a swing jaw crusher is carried on the swing jaw! So listen—in the "KVS" BOTH jaws (swing and stationary) are set at the same inclination. Stationary jaw carried fully 50 percent of load . . . result, you need LESS POWER to keep the swing jaw swinging and crushing. Note another thing—the swing jaw is all ONE PIECE, except renewable crushing plate. Also swing and stationary jaws are interchangeable, both the same length, and reversible end-for-end, giving TWICE as much jaw crushing life before renewal.



Products with the troubles LEFT OUT

IN ANYBODY'S LANGUAGE-

Bethlehem Wire Rope Means Low Cost Per Unit of Work

In country after country all over the world Bethlehem wire rope has consistently proved its basic economy. Reason: its long life in service, which means low cost per unit of work—the only *true* yardstick of rope costs.

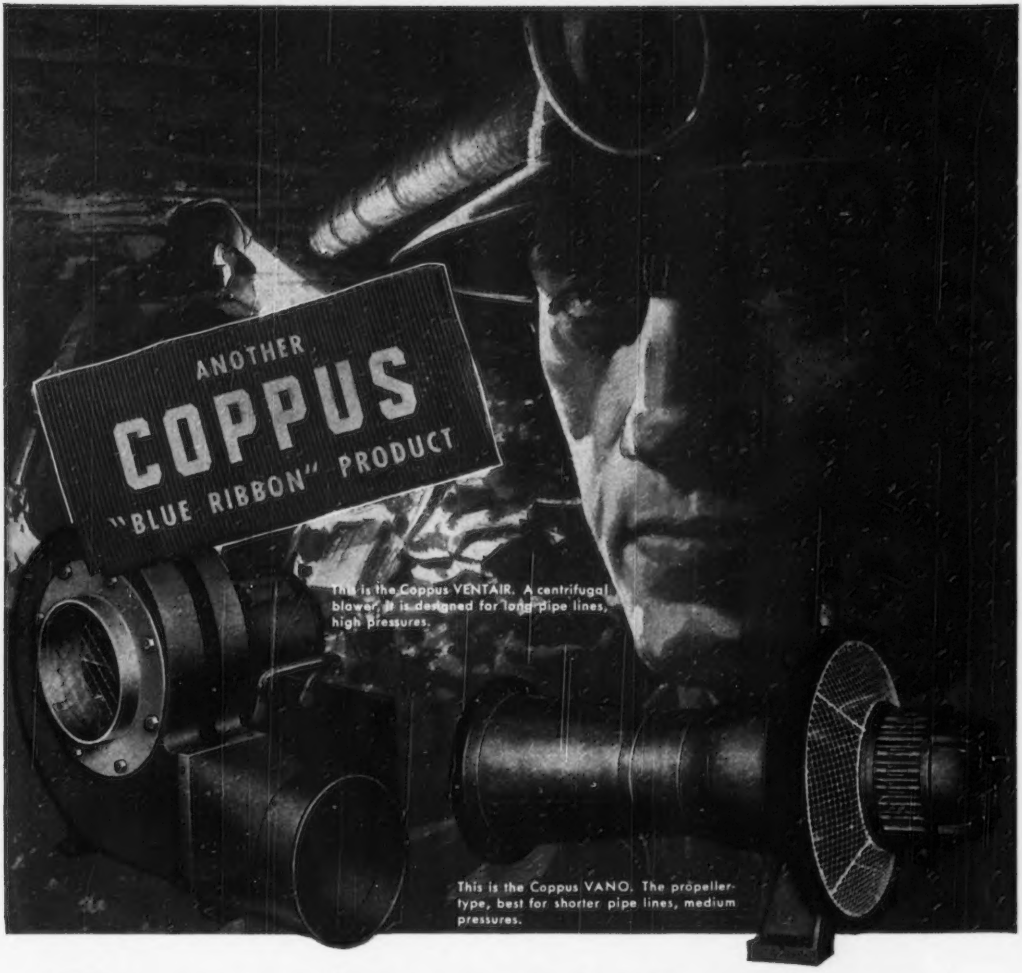
Every wire rope will do a certain amount of work, and it is often possible to record this in terms of definite units. That is, throughout its life the rope will move so many cubic yards of rock, or haul so many loaded cars up a hill, or lift and lower so many tons of drill pipe through varying distances, etc. Obviously, the rope cost should not be measured by purchase price alone, but by the cost of each unit of service the rope gives you.

In other words, the rope with the low price tag may look like a bargain, yet render such limited service that the cost per unit of work is high. On the other hand, a quality rope—costing more at the time of purchase, perhaps—can be a *real* bargain because of the long-term, efficient job it does.

Bethlehem wire rope is a quality product, made by craftsmen in one of the world's finest mills. It is built to give the user *low* cost per unit of work . . . to give him his money's worth and more. You can buy it with confidence; use it with the knowledge that it will serve you long and well.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation


ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT
This is the Coppus VENTAIR. A centrifugal blower. It is designed for long pipe lines, high pressures.
This is the Coppus VANO. The propeller-type, best for shorter pipe lines, medium pressures.

These are the cost-reducing Blowers that give up to 100% more air

Only Coppus makes both types — and both are made especially for *mine* ventilation. One or the other, operating under the conditions for which it is designed, delivers from 30% to 100% more air for a given power consumption than an ordinary all-purpose fan.

They can be used as blowers or exhausters and are driven either by compressed air or electric motor, with capacities up to 90,000 CFM. Like all Coppus products, these blowers wear the "Blue Ribbon" that stands for high achievement in engineering, workmanship and performance.

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corp., Worcester 2, Mass.

COPPUS ENGINEERING CORPORATION
283 Park Avenue, Worcester 2, Mass.

Please send.....Bulletin 130

Name .....

Company .....

Address .....

CUMMINS Dependable DIESEL

SINCE 1918...PIONEER OF PROFITABLE POWER THROUGH HIGH SPEED DIESELS

Here's what you get with

Cummins Diesels

Here are four more honest-to-goodness examples of how owners have saved money—and made money—with Cummins Diesel Engines:

Service One of the more than 200 Cummins Dealers is as close as your phone.

Highspeed Diesel Engines (50-550 hp) for:

On-highway trucks • off-highway trucks • buses • tractors • earth-movers • shovels • cranes • industrial locomotives • air compressors • logging yarders and loaders • drilling rigs • centrifugal pumps • generator sets and power units • work boats and pleasure craft.

CUMMINS ENGINE COMPANY

LESS FUEL

A Cummins Diesel working for R. A. Wade and Company near Anniston, Ala., uses only three gallons of low-cost Diesel fuel an hour—powers an ore washing plant at a mine that produces 400 tons of iron ore a day. The equipment powered by the Cummins Diesel includes a rotary grizzly, a rotary crusher, a 25-foot double-log washer, a 10′ x 4′ screen, and a 20-inch conveyor belt.

LESS MAINTENANCE

Six 200 hp Cummins Diesels powering Kenworth tractor-trailer hauling units used at the Homestead Mine near Earlington, Ky., *required no repairs in the first 16 months of operation.* Carrying 35-ton loads, these Cummins-Powered units each average 40 trips a shift on the three to four-mile round-trip haul from pit to tipple.

LONGER LIFE

Ever since 1938, 33 *Cummins-Powered* Macks have performed all the hauling work at International Nickel's Frood-Strobie open pit mine near Sudbury, Ontario. Coming out of the pit, these 33 units take the eight per cent grade at high average speeds. Twenty-three of the Macks are powered with Model NHBS-600 and 10 with HBS-600 Cummins Diesels.

MORE WORK

For four years, a fleet of Cummins-Powered Euclid Rear Dumps has been working 24 hours a day, six days a week, during the six-month mining season at Steep Rock Iron Mines, in northwestern Ontario. They have hauled one million tons of iron ore out of a 300-foot deep open pit. Every two minutes a Cummins-Powered Rear Dump unloads 22 tons of ore or waste. Every day the Cummins-Powered fleet speeds 10,000 tons up the eight per cent grade out of the pit.

These typical examples of the profit-making power furnished by Cummins *Dependable* Diesels explain why men who pay the most attention to cost sheets and profit and loss statements choose Cummins Power. Write for further proof that Cummins Diesels can save and make *more* money for you.

Cost Conscious? **CHOOSE CUMMINS DIESELS**

INC. • COLUMBUS, INDIANA

EXPORT: CUMMINS DIESEL EXPORT CORPORATION • COLUMBUS, INDIANA, U.S.A. • CABLE: CUMDIEX

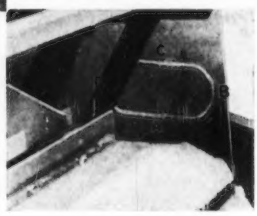
NEW

a major advance in the mechanical refinement of classification units

THE DORR HX CLASSIFIER—DUPLEX MODEL

...the Dorr TYPE H Classifier

◀ Chalk marking the rake path of a duplex Dorr HX Classifier in shop demonstration.



Type H Classifier rake path ▶ chalked on side of tank. Note flat raking and return strokes (A and C) and elliptical raising and lowering strokes (B and D). Regular pattern of rake path shows how rakes are synchronized both horizontally and vertically and balanced at all times.

Incorporating an entirely new and radically different headmotion design and rake path, the new Dorr Type H Classifier line represents a major step forward in the mechanical refinement of classification units. It offers many definite advantages over its predecessor, the Type F . . . yet retains all the features which have made the Dorr Classifier an accepted standard throughout the world.

Simplicity is the keynote of Type H design. It has few moving parts and the simplest Classifier lubrication system yet devised. It employs a fully harmonic raking motion and a long, full-load raking stroke. It is equipped with a hydraulic lift mechanism that provides more than 12 inches of rake lift in the pool. It is designed for *work* . . . for high efficiencies and low operating cost.

Bulletin #2281 gives complete information on this radically different unit. Write for your copy now . . . or better still, have a Dorr engineer show you what the superiority of Type H design means in terms of your own operation. No obligation, of course.

DORRCO

THE DORR COMPANY, ENGINEERS
BARRY PLACE, STAMFORD, CONN.
NEW YORK • ATLANTA • TORONTO
CHICAGO • DENVER • LOS ANGELES
RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.
SUGAR PROCESSING
PETREE & DORR DIVISION, STAMFORD, CONN.
ASSOCIATES AND REPRESENTATIVES
Dorr Technical Services and Equipment Are Also Available Through Associated Companies and Representatives in the Principal Cities of the World. Names and Addresses on Request.

DORR

RESEARCH ENGINEERING EQUIPMENT

Thermoid Research Gives Greater Flexibility and Wear-ability to New-Type Hose!

Thermoid has designed *Thermine* Air Hose especially for more efficient and economical use in drilling operations—from construction jobs to mining.

Increased flexibility allows greater freedom of movement and permits bending the hose easily around tight corners. A heavy synthetic rubber oil-proof tube is reinforced with heavy braided rayon cord. Smooth, extra-heavy rubber cover offers maximum resistance to abrasion and cutting by sharp rocks.

Thermine Air Hose is mandrel-built from ¼" to 1½" inclusive in 50 ft. lengths. Available at your nearest Thermoid Distributor.

Thermoid Quality Products: Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Molded Products • Industrial Brake Linings and Friction Materials.

For *Complete* Satisfaction *Specify* Thermoid!

Thermoid Company

Main Offices and Factory • Trenton, N. J., U. S. A.
Western Offices and Factory • Nephi, Utah, U. S. A.
Industrial Rubber Products • Friction Materials • Oil Field Products

DENVER-DILLON (Floating Circle) VIBRATING SCREENS

IN STOCK FOR QUICK DELIVERY...

STEEL-HEAD BALL-ROD MILLS

SELECTIVE MINERAL JIGS

SUB-A FLOTATION MACHINES

SPIRAL RAKE THICKENERS

ADJUSTABLE STROKE DIAPHRAGM PUMPS

AGITATORS CONDITIONERS

DISC FILTERS

VIBRATING SCREENS

CROSS-FLOW CLASSIFIERS

VERTICAL SAND PUMPS

JAW CRUSHERS

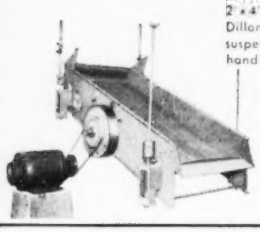
1½′ x 3′ Double-Deck Denver - Dillon Vibrating Screen, right-hand drive, showing how 1½′ x 3′ screen can be mounted on frame with casters.

1½′ x 3′ Single-Deck

Bare Screen		Add for ½ H.P. motor, motor mounting and drive.
$338	Weight 225 lbs.	Price $89 Weight 108 lbs.

1½′ x 3′ Double-Deck

Bare Screen		Add for ¾ H.P. motor, motor mounting and drive.
$371	Weight 350 lbs.	Price $101 Weight 122 lbs.



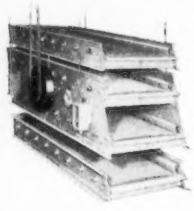
2′ x 4′ Single-Deck Denver-Dillon Vibrating Screen, suspension mounting, right hand drive.

2′ x 4′ Single-Deck

Bare Screen		Add for ¾ H.P. motor, motor mounting and drive.
$432	Weight 350 lbs.	Price $101 Weight 122 lbs.

2′ x 4′ Double-Deck

Bare Screen		Add for 1 H.P. motor, motor mounting and drive.
$473	Weight 600 lbs.	Price $117 Weight 135 lbs.



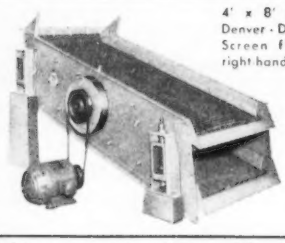
3′ x 6′ Double-Deck Denver - Dillon Vibrating Screen showing how additional deck may be added. Undersize hopper and dust or top cover may be added.

3′ x 6′ Single-Deck

Bare Screen		Add for 2 H.P. motor, motor mounting and drive.
$869	Weight 725 lbs.	Price $150 Weight 170 lbs.

3′ x 6′ Double-Deck

Bare Screen		Add for 3 H.P. motor, motor mounting and drive.
$954	Weight 1200 lbs.	Price $168 Weight 180 lbs.



4′ x 8′ Double-Deck Denver - Dillon Vibrating Screen floor mounted, right hand drive.

4′ x 8′ Single-Deck

Bare Screen		Add for 3 H.P. motor, motor mounting and drive.
$1402	Weight 1275 lbs.	Price $168 Weight 180 lbs.

4′ x 8′ Double-Deck

Bare Screen		Add for 5 H.P. motor, motor mounting and drive.
$1545	Weight 2100 lbs.	Price $205 Weight 245 lbs.

● 2-bearing operation of Denver-Dillon Vibrating Screen reduces power as much as one half. Positive action reduces blinding, makes accurate size separations. Low weight, low h.p. and distinctive patented features give efficient results.

All motors are totally enclosed, ball bearing. Mounting is suspended spring type motor plate for suspended drive. (Hinged motor base for floor mounting drive also available.)

PRICES

Prices are firm through February, March and April 1950. Above prices are f.o.b. Denver or Colorado Springs, Colorado, packed for domestic shipment only. Prices for export are slightly higher and include rugged packing.

ORDER TODAY

When ordering please advise electrical characteristics. Right hand machines as shown will be furnished unless left hand is desired. Screens will be shipped via lowest transportation cost unless otherwise specified.

Phone us at CHerry 4466, Denver or Wire DECO Denver

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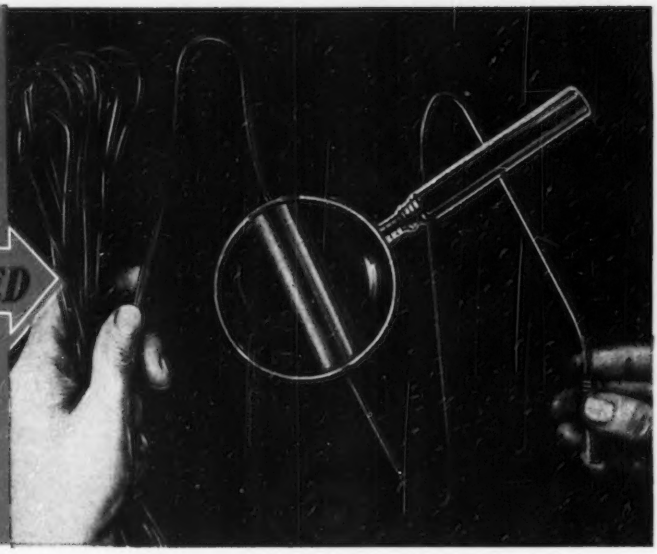
ATLAS

PLASTIC-INSULATED

blasting cap wiring



Designed for roughest field conditions... to meet the most exacting demands of blasters

Hundreds of good plastic insulating compounds were tried and rejected by Atlas Research before the new Atlas plastic-covered wire was developed. Our wire had to measure up to the most rigid demands of men who use electric blasting caps under every conceivable condition.

If you're one of our many customers who have already tried the new Atlas plastic-covered leg wires or connecting wire, you'll agree that this wire comes up to the highest expectations—and more! Here's why:

1. ***It's really tough — and truly waterproof!*** Thick plastic covering, made to withstand rough handling in jagged bore holes. Fully waterproof. Extremely high insulating value.
2. ***Less kinking and snarling!*** With minimum care, it folds or reels out without tangles or kinks—saves time and tempers in hooking up.
3. ***Flexible at 20° below zero!*** Made to withstand Arctic or Tropic weather.
4. ***Easy on eyes and hands!*** No eye-strain to see the brilliant orange or yellow wire, even in dull light. No rough edges when duplex wire is separated into single strands.
5. ***Stands up to rigid tests!*** Compare it with other wire for these outstanding properties; and also for high tensile and compression strength; resistance to deterioration from weather, rodents, vermin.

Now available in duplex on all Atlas Manasite electric blasting caps with wires 30 feet long or more. Two single plastic-covered wires on shorter lengths.

Another outstanding contribution to explosives progress by the makers of ROCKMASTER, the original split-second delay blasting system.

ROCKMASTER, MANASITE: Reg. U.S. Pat. Off.

ATLAS EXPLOSIVES *"Everything for Blasting"*

CHEMICALS ATLAS EXPLOSIVES

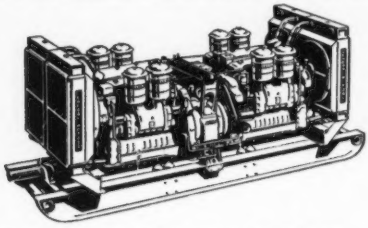
ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

2260 hours without a minute's down time

"NEVER failed us once," says A. R. Lundahl, chief engineer of Standard Collieries, speaking of the General Motors Diesel "Quad" in this 9-yard dragline. "And it's nothing for this machine to lift 375 yards of dirt an hour, 24 hours a day."

That's because these high-powered two-cycle Diesels accelerate rapidly—they're quick on the trigger. They deliver a smooth, steady power output—twice as many power impulses for each revolution of the crankshaft. This added power-per-turn makes them more compact with more horsepower for their size than other type engines. They start instantly on their own fuel. Their clean, simple design and high interchangeability of parts make maintenance much easier.

Add up these advantages and you'll see why General Motors Series 71 Diesels are taking over so many tough jobs in mining. Let us show you how these engines can bring greater efficiency and economy to your operation. Call your GM Diesel distributor or write for details.



Standard Collieries, Clinton, Indiana, repowered this Model 6W Bucyrus-Monighan dragline with a GM Series 71 Diesel "Quad 6." Only three of the four engines are normally operated at one time—saving wear and extending engine life.

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES . . . Up to 200 H. P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS . . . Up to 800 H. P.

GENERAL MOTORS

GM GENERAL MOTORS DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK

Now...Available in Larger Sizes!

HYDROCONE* (Type R) CRUSHERS

***The term "Type R" by which these Allis-Chalmers crushers have been known has been changed to "*Hydrocone*." "Hydro" denotes the use of a static liquid, such as oil, used in the *Hydrocone* crusher for supporting and adjusting the height of the crushing cone. The principle of operation has not been changed.**

TO MEET new requirements for fine crushing in a larger range of capacities, Allis-Chalmers offers the expanded line of *Hydrocone* crushers, in sizes up to 1784 (17-in. receiving opening; 84-in. diameter cone) with coarse, intermediate or fine crushing chambers.

In the *Hydrocone* design the crusher's main shaft is raised or lowered hydraulically (push-button operation on the larger sizes) permitting quick, accurate product size adjustment without stopping the crusher. An Automatic Reset device lowers the entire crushing head hydraulically to pass uncrushable materials.

- Wobble plate feeder distributes feed evenly — standard equipment for crushers with fine crushing chambers.
- Spiral bevel gears, anti-friction bearings and improved clean oil lubrication. Smooth operation; long life!
- Simplicity of design reduces maintenance costs substantially.

Get the complete facts about *Hydrocone* crushers — in sizes 122 to 1784 — from the Allis-Chalmers representative in your area. A-2933

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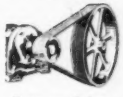
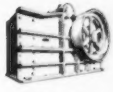
Motors — Controls


Texrope Drives

Vibrating Screens


Jaw Crushers

Kilns, Coolers, Dryers

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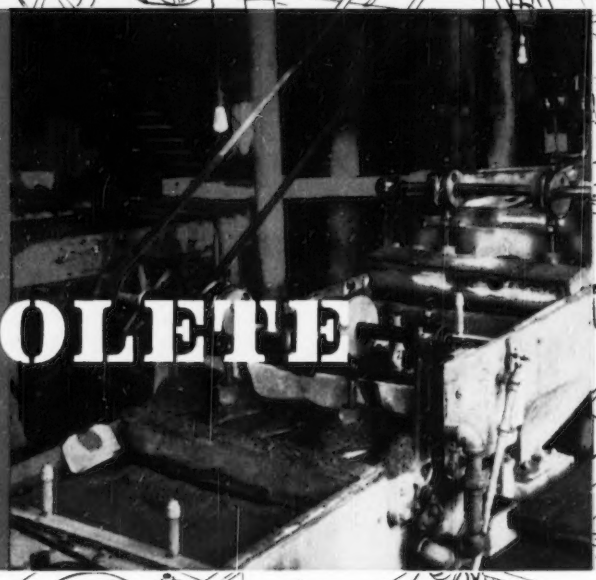
LEAD-ZINC FLOW SCHEMES GROW OBSOLETE TOO!



Read How 7 Mills Modernized Milling Practice to Increase Operating Profits

Vanners, tables and jigs served well as primary milling methods only to be superseded by more selective, more efficient chemical flotation. By the same token, traditional lead-zinc reagent combinations are themselves being obsoleted by technical progress and economic change.

Many metallurgists find that substitution or addition of the newer Cyanamid reagents produces higher grades, lower tails or both. Others find that modified combinations of older reagents in new flow schemes can offset rising costs or lower-grade mill feed. All started with an open mind . . . realizing that as the list of new reagents grows, possible combinations are as many and varied as ore bodies, operating conditions and competitive situations in the base metal industry.

Typical of what can be done are these abstracts from among the many examples of progressive base-metal beneficiation in Cyanamid Mineral Dressing Laboratory records:

ARIZONA Profitable operation of a 100 ton per day mill treating a lead-zinc-gold ore in Arizona was achieved when the correct reagent combination was found for the large percentage of oxidized lead ore in the mill feed. In obtaining a concentration of the sulphide and oxidized lead minerals, AEROFLOAT® 31, cresylic acid and soda ash are added to the ball mill. Thiocarbanilide 130 and xanthate, added to the sulphide lead rougher cells, are used as sulphide lead promoters. To the tailing from the sulphide lead cells 3 lbs. per ton of Reagent 425;0.4 lbs. per ton of xanthate and large amounts of sodium sulphide are added. From feed containing 1% sulphide lead and 10% oxide lead, a combined lead concentrate is made assaying 60% Pb with a tailing of 1.5% Pb. Overall recovery is 82%, with 16% of the lead in the sulfide concentrate and 66% in the non-sulfide concentrate.

Further testing in the field has shown that, by adding Reagent 425 to the ball mill, recovery in the sulphide concentrate can be increased to 25%, and recovery in the non-sulphide concentrate to 67%—making an overall recovery of better than 90% with no loss in grade. These results confirm other tests, tending to prove that lead recovery is increased if the slimed particles are coated with reagents as soon as formed.

IDAHO At a large sulphide lead-zinc flotation mill, extensive tests have been conducted over the past two years to determine the best reagent combination. As a result, the following combination has been adopted in place of reagents formerly used:

Pb Circuit	*Zn Circuit*
AERO Brand Cyanide	Cresylic Acid
Zinc Sulphate	Copper Sulphate
AEROFLOAT 31	Sodium AEROFLOAT "B"
Cresylic Acid	

Recoveries are improved and grade of zinc concentrate has increased from 46% to 52% Zn.

CANADA The presence of mica is not often a problem in a lead-zinc-silver ore but it made maintenance of lead concentrate grade erratic at this 550 ton per day Canadian flotation plant. Ore contains 1.2% lead; 5% zinc and 2 ounces of silver. Grade varied from 35 to 70% Pb, depending on the amount of mica floating with the lead. Tests with various traditional and new reagents showed that the use of only .04 lbs. per ton of Reagent 620 in the lead cleaner circuit would depress the mica and stabilize grade at 60% Pb with excellent lead recovery. Because the mica can now be separated from lead successfully through the use of Reagent 620, mica is a potentially marketable product, instead of a source of trouble.

ARIZONA At this lead-zinc property two classes of ore are mined and milled separately; 500 tons per day of mixed sulphide ore and 100 tons per day of oxide lead ore containing cerussite, wulfenite, galena, anglesite and vanadinite. Test work showed the best promoter combination in the oxide circuit to be Reagent 425 and Reagent 301, used with sodium sulphide in a soda ash circuit with a pH of 8.8 to 9.0. AEROFLOAT 31 as a supplementary promoter and frother, and cresylic acid as a frother are also used. From a head value of 3.23% Pb, a recovery of 88.55% was made in a concentrate assaying 50.52% Pb. Further testing on the mill showed that changing the point of addition of the AEROFLOAT 31—cresylic acid mixture from the first flotation machine to the grinding circuit resulted in increasing recovery of lead to 93%. Recoveries of precious metal values are excellent.

In the sulphide lead-zinc circuit AERO Brand Cyanide has been found most effective as a depressant in the lead circuit, with Thiocarbanilide 130 as the principal lead promoter.

COLORADO A large flotation mill in Colorado treating complex mine and custom ores containing lead, zinc, gold, silver, and copper, mainly in sulphide state, found that special reagents could improve operating results. In this mill, a bulk float of sulphide minerals is first made with Reagent 404 (.08 #/Ton) and Pentasol Xanthate. The bulk concentrate is reground at a pH of 8.5 with AERO Brand Cyanide, lime, zinc sulphate to depress the zinc. Sodium sulphite and a small amount of Reagent 444 are added to float a concentrate containing gold, silver, lead and copper which is shipped to the smelter. The zinc minerals are activated at a pH of 9.4 with copper sulphate and floated with Sodium AEROFLOAT "B" for shipment to the zinc smelter.

AFRICA A 1200 ton per day lead-copper-zinc producer in Africa is treating approximately 500 tons of highly oxidized dump ores containing sulfide and oxide minerals in one section of the mill and 700 tons of run of mine sulfide ore in separate grinding and flotation circuits. Dump ore flowsheet involves first the production of a bulk sulfide concentrate, then the sphalerite in this concentrate is floated away from the lead and copper sulfides using sodium dichromate and approximately 0.25 lbs. per ton of ore of Reagent 610. Satisfactory grades of zinc concentrate and lead-copper concentrate are produced.

The oxide lead and copper minerals in the bulk sulfide tailing are floated with sodium-hydrosulfide, Reagent 301 and varying amounts of Reagent 404 up to 1.0 lb. per ton of ore. Run-of-mine ore is treated by conventional selective flotation procedures.

COLORADO This 500 ton per day base metal mill treats a sulphide ore containing galena, chalcopyrite and sphalerite in a quartz gangue. Copper and lead are floated first, followed by a zinc float; the copper and lead being separated in a third circuit. Promoters for the first float are Reagent 404 (0.05 lbs/ton) and amyl xanthate (0.04 lbs/ton). Sodium cyanide, zinc sulphate and sodium sulfite are the chief depressants. For separating the copper-lead concentrate only sodium cyanide (0.40 lbs/ton) and sodium sulphite (0.08 lbs/ton) are used. Lead concentrates average over 67% Pb, with 91% recovery from a head of 2.73% Pb. The copper concentrates average 25% Cu, with 82% recovery from a head of 0.97% Cu. The metallurgist for this operation reports that Reagent 404 was found to have the highest selectivity for galena of the many reagents tried.

** Aerofloat is a registered trademark of American Cyanamid Co. applied to certain flotation reagents of its manufacture.*

You, too, may profit by challenging time-honored ideas of permissible reagent costs and relative reagent efficiencies. New Cyanamid reagents, known to be more efficient but sometimes considered too high-priced, may prove to be most economical under today's mill operating conditions. In your own check-up of treatment methods and reagent combinations, Cyanamid Field Engineers and the Cyanamid Mineral Dressing Laboratory stand ready to help. An unbiased review of your present beneficiation practice may reveal worthwhile opportunities to increase recovery, cut costs or expand output. Starting point is a discussion of your current metallurgy and ultimate objectives.

AMERICAN Cyanamid COMPANY

MINERAL DRESSING DIVISION

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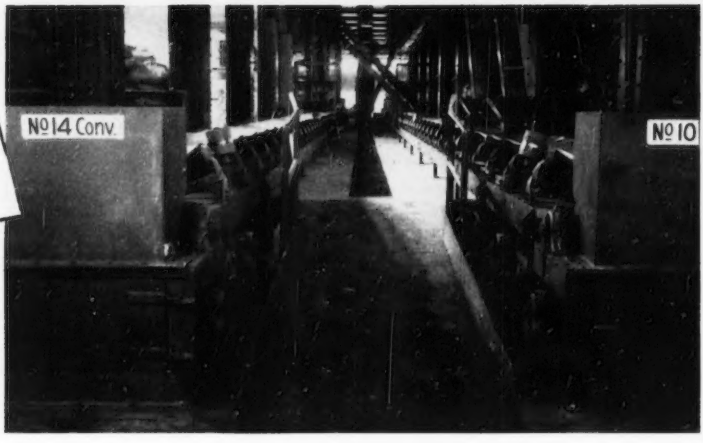

56 Conveying Operations in One System

With this S-A designed bulk materials handling system the big job of sorting, storing in the proper bin and shipping several different kinds and types of materials is made easy. With 2 S-A belt conveyors located above 28 storage bins and two more S-A belt conveyors located underneath them, sorting and shipping is routine and at lowest cost per ton.

But, engineering of bulk materials handling systems to do unusual as well as routine conveying jobs has been the life work of S-A engineers for half a century. The way they apply the latest techniques in the creation of systems to deliver the most tons at lowest cost makes S-A engineering in constant demand in almost every line of industry.

Put the recommendations of S-A engineers to work for you. There's no obligation, of course, so before you make a change in conveying equipment, call on them first. Write today.

MINNESOTA MINING & MFG. CO.
CORONA, CALIFORNIA

Located above 28 steel storage tanks of 70 ton capacity each, two S-A belt conveyors 18" wide and 131 feet long sort a wide variety of materials and deliver them to proper bins. Two S-A traveling trippers operating on rails permit discharge to proper bins. Two additional S-A belt conveyors operate under the tanks. Electrically operated gates and swivel chutes deliver material to belts which convey to loading bins. System also permits recirculating material to storage bins above.

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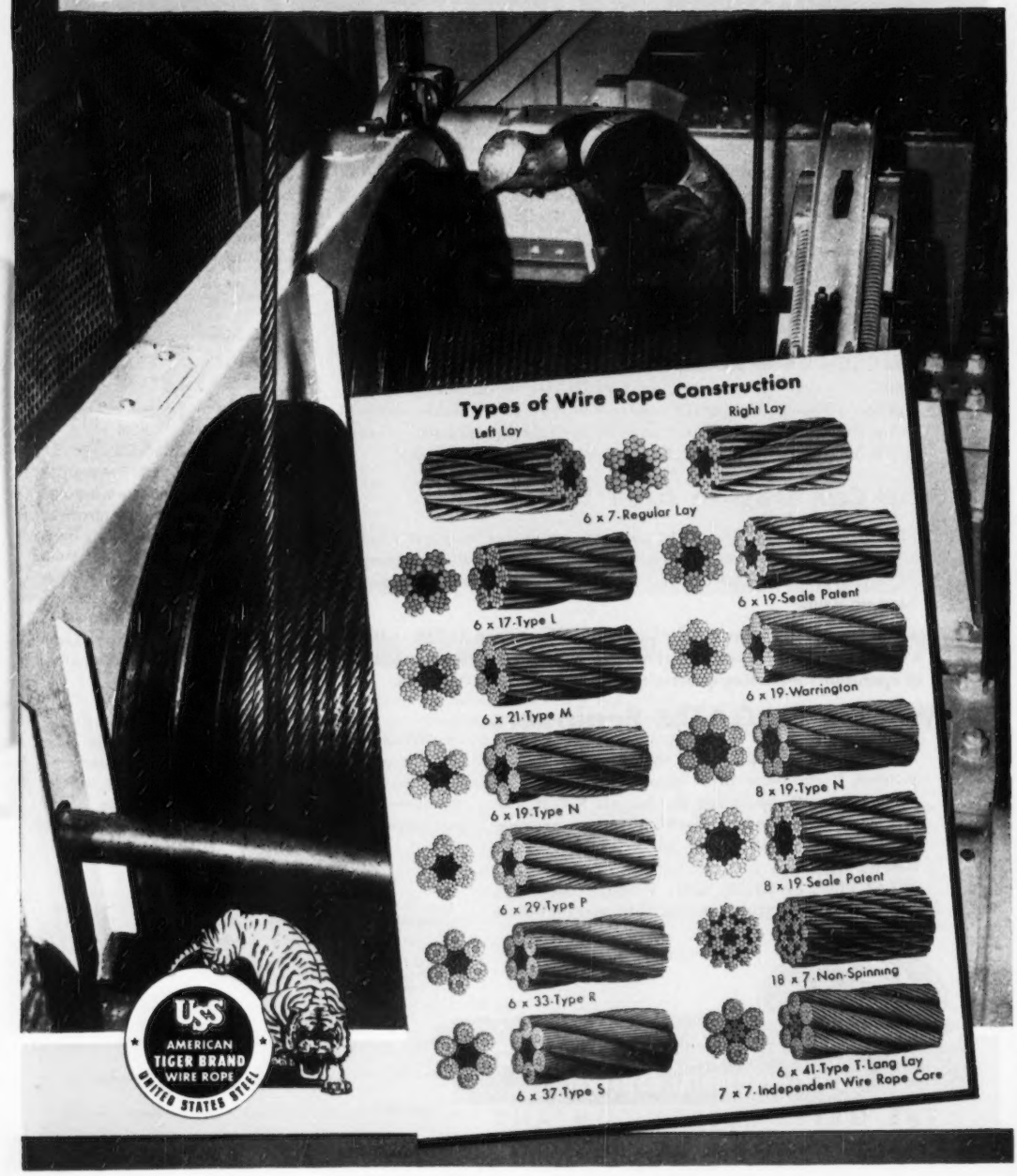
The Tiger Brand Specialist says-



"Here's what you should know about wire rope —and how to select, use and care for it."

THE three most important qualities that wire rope must possess are (1) strength, (2) fatigue resistance, and (3) abrasion resistance. Whether the rope is used on hoists, cranes, excavators, conveyors, loaders or unloaders, these properties are required in varying degrees depending on serivce requirements.

STRENGTH—This is determined by size, grade, and construction. Wire for wire rope can be made in any desired tensile strength ranging from iron grade at approximately 100,000 lbs. per sq. in. to improved plow steel grade at approximately 250,000 lbs. per sq. in. The knack of making Tiger Brand Ropes with uniform strength throughout shows the skill of the wire rope manufacturer.

FATIGUE RESISTANCE—The ability to make wire that will stand thousands of bends over drums and sheaves without breaking is no small accomplishment. The wire must be made with just the right amount of toughness and ductility. Tiger Brand Wire Rope is made from wire especially fabricated for wire rope use. Ropes composed of a large number of small wires will have higher fatigue resistance than those made with a smaller number of large wires.

ABRASION RESISTANCE—This is determined by the size and chemistry of the wires, especially the outer wires as they are exposed to the most wear. Obviously, the larger the wire size the greater the resistance to abrasion. Furthermore, the high strength steels are better able to withstand wear because of a greater carbon content. This means that improved plow steel ropes would have the highest abrasion resistance.

Getting the right balance

Individually, the properties of strength, fatigue resistance, and abrasion resistance are not difficult to obtain . . . but in wire rope making, it is impossible to accent one property without detriment to the other two. That's why the skill and experience of the men who make Tiger Brand Wire Rope are so important. Satisfactory performance demands that running ropes possess all three properties and therefore it is necessary to obtain an effective balance which meets the requirements of your particular job.

How to get longer wire rope life

Don't overload the rope.

Don't subject the rope to sudden impact loads.

Don't use undersize sheaves and drums—this is the commonest cause of fatigue breaks.

If vibration is present, make regular cuts from the end of the rope so as to change the dampened section.

Keep groove diameters proper size so as to avoid pinching of rope.

Avoid flange wear as a result of bad sheave alignment.

If grooves become fluted, it is usually a sign that the sheaves should be replaced with a harder material.

Lubricate regularly. Wire rope is a machine and requires adequate lubrication. It must also be protected from corrosion to retain strength.

Avoid kinking, improperly attached fittings, and uneven drum winding.

Make use of the Tiger Brand Wire Rope Specialist

It is very much to your advantage and to ours to maintain good operating practices. Call in the Tiger Brand Specialist at regular intervals and have him give you a FREE Check-up. He is thoroughly experienced in proper wire rope application.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
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Please send me a copy of your catalog, "American Tiger Brand Wire Rope."

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UNITED STATES STEEL

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MINE TIMBER
Replacement Costs

Use penta-chlorophenol treated wood!

The cost of replacing mine timbers is a major item in the operation of most mines. This expense can be materially reduced by the use of PENTA-treated timbers which effectively resist decay and termites.

PENTA-protection is *dependable* protection. PENTA-treated timbers last two to four times longer than untreated timbers. Due to its low water solubility, PENTA lasts for years, *even under the most adverse mine conditions.*

PENTA-protection is clean protection. Men do not object to working with PENTA-treated timbers, and no special precautions are needed to handle them. For more information about PENTAchlorophenol, write to Dow, Dept. PE. 30.

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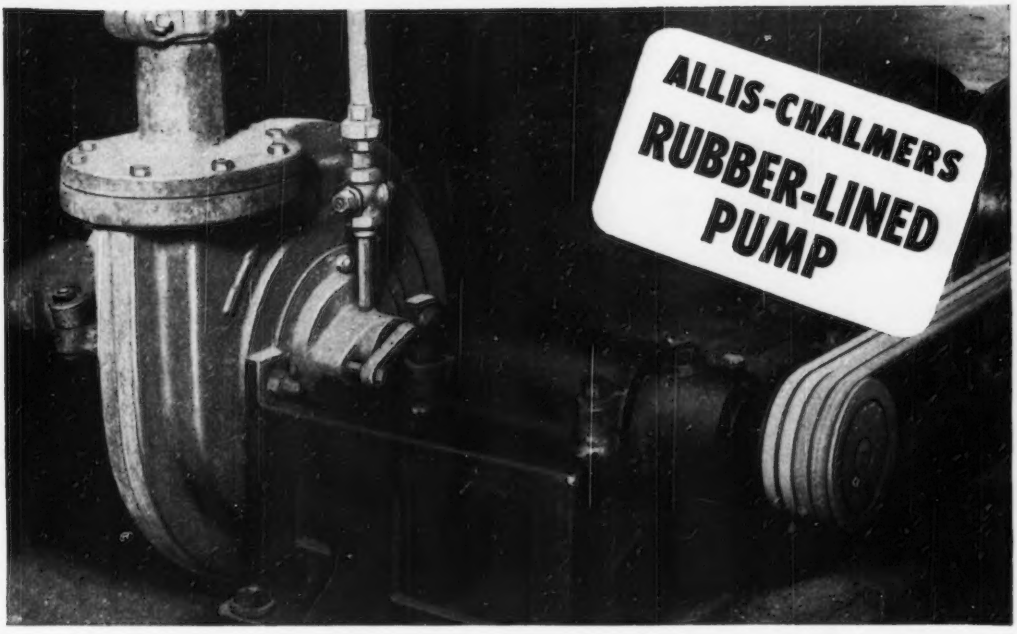


NEW Long Life Pump for Fine Mesh Materials

FOR MANY APPLICATIONS this new Allis-Chalmers Rubber Lined Centrifugal Pump offers great economies over both standard and special types of metal pumps. It is especially effective for handling difficult fine mesh materials (⅛" to 325 mesh) such as sand slurries, slimes and muds, tailings, concentrates and similar substances.

GREATER ABRASION RESISTANCE

The rubber lining offers as much as fifteen times the resistance to abrasion that the hardest special metals offer. The lining is formed around a steel skeleton which allows close control of the properties of the rubber. The lining is then secured in the casing. This unique method provides a mechanically strong and rigid lining which is not subject to "sand blistering."

ADAPTABLE TO YOUR NEEDS

Many different rubber compounds are available to provide longest life in your particular application. A wide range of sizes covers almost every need and, in addition, the capacity is variable by simply changing the speed of the impeller through the *Texrope* V-belt drive. *Vari-Pitch* Automatic Sheave drive provides instant speed changes.

Find out how this new Allis-Chalmers Rubber-Lined pump can save money for you. Ask your nearest A-C Sales Office or send in the coupon today.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

Send For Free Bulletin

ALLIS-CHALMERS, 969A SO. 70 ST.
MILWAUKEE, WIS.

Please send me Bulletin 08B7311 describing the new Allis-Chalmers Rubber Lined Centrifugal Pump.

Name.....

Position.....

Company.....

Address.....

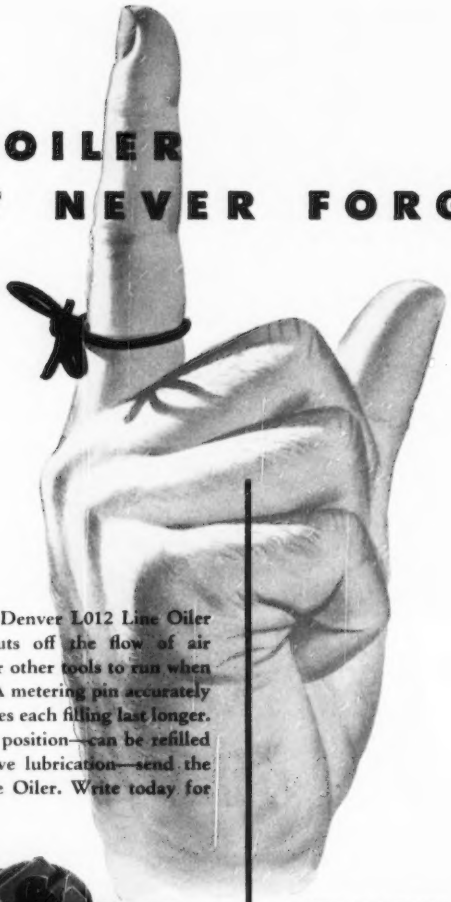
City.....State.....

A-2992

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

THE OILER THAT NEVER FORGETS !



When a Gardner-Denver L012 Line Oiler runs out of oil—it automatically shuts off the flow of air through the line. No chance for drill or other tools to run when dry! You save oil, too, with the L012. A metering pin accurately regulates the flow of atomized oil—makes each filling last longer. The L012 operates equally well in any position—can be refilled without stopping the work. For positive lubrication—send the oil by air with a Gardner-Denver Line Oiler. Write today for complete information.

Gardner-Denver L012 Automatic Line Oiler—for any tool using 25 to 500 cubic feet of air per minute. Oil capacity—one pint.

OTHER GARDNER-DENVER LINE OILERS

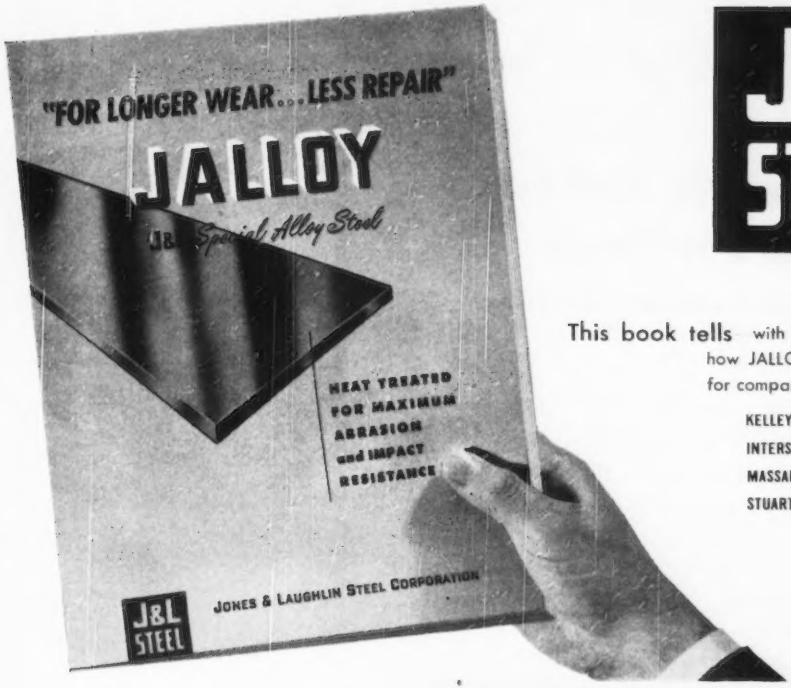
Models L07, L08 and L09

Models L011 and L014

Model	L07	L08	L09	L011	L0114
For Air Flow (Cu. Ft. per Min.)	75-450	35-200	10-75	75-450	75-450
For Use with	Large Drills	Small Drills	Air Tools	Wagon Drills	Mine Car Loaders

GARDNER-DENVER *Since 1859*

Gardner-Denver Company, Quincy, Illinois
In Canada:
Gardner-Denver Company (Canada) Ltd., Toronto, Ontario


"FOR LONGER WEAR... LESS REPAIR"
JALLOY
J&L Special Alloy Steel
HEAT TREATED FOR MAXIMUM ABRASION and IMPACT RESISTANCE
J&L STEEL
JONES & LAUGHLIN STEEL CORPORATION

J&L STEEL

This book tells *with facts and figures*—just how JALLOY Steel saves money for companies like these:

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INTERSTATE IRON CO.
MASSAPONAX SAND & GRAVEL CO.
STUART M. PERRY CO.

Learn how others SAVE MONEY with J&L JALLOY Steel

Is abrasion eating up YOUR PROFITS?

JALLOY heat-treated plate is the steel that is saving users' money through *longer wear . . . less repair.* Every design engineer, operating man and maintenance superintendent should have a copy of this 36-page, illustrated book that shows how much longer JALLOY Steel lasts where abrasion and impact limits the life of equipment. The coupon at the right may help you change losses into profits.

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Without obligation, send me a FREE copy of "JALLOY — J&L Special Alloy Steel," the book that tells how I can reduce maintenance cost through *longer wear . . . less repair.*

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FOR ALL MAJOR SERVICES
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Walworth Valves and Fittings

assure low cost dependable performance

Walworth manufactures a **complete line** of valves and pipe fittings for ALL major services in principal industries. All Walworth products are made to the highest standards of quality, both as to dimensional accuracy and metallurgical properties. In design, construction, and performance, they reflect Walworth's 105 years of "know how" in the manufacture of quality valves and fittings.

Your Walworth distributor will give you full information on the **complete line** of Walworth steel, iron, and bronze valves, and pipe fittings; also Walworth Lubricated Plug Valves, and Walseal* valves, fittings and flanges. Ask for this information today.

*Patented–Reg. U. S. Pat. Off.

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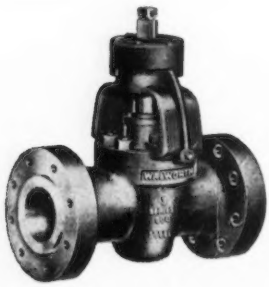
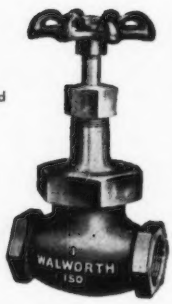
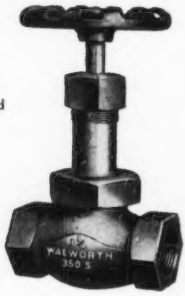
DISTRIBUTORS IN PRINCIPAL CENTERS
THROUGHOUT THE WORLD



Pressure-Seal Steel Valve

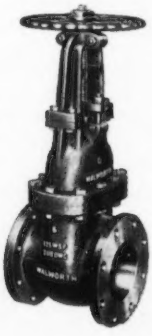


No. 95 150-Pound Bronze Valve
Renewable Disc



No. 225P 350-Pound Bronze Valve
"500 Brinell" Seat & Disc

No. 709 Iron Body Saddle Gate Valve



No. 726F Iron Body Wedge Gate Valve

MAKING A **TOUGH** CABLE

Tougher!

Stripping off the lead sheath after a Tirex Cable has been "Cured-In-Lead"

. . . That's what the "Cured-In-Lead" process is doing for every TIREX portable cable — adding extra wearability to their Selenium Neoprene Armor to assure long, trouble-free service under the most severe operating conditions.

HERE'S HOW IT'S DONE

Before jacket vulcanization the cable is run through a lead press which forms a lead "pipe" snugly around the jacket. During vulcanization this pipe firmly holds the cable, preventing any distortion of the jacket while it is still soft and pliable and assuring maximum density. When vulcanization is completed the lead is stripped off leaving an extra-tough jacket that needs no additional protection.

HERE'S WHAT IT DOES

It produces a jacket that is unexcelled for effective resistance to abrasion and rough handling . . . provides it with a smooth outer surface which slides easily around obstructions without cutting or tearing . . . maintains uniform diameter, assuring easy and compact reeling or coiling . . . furnishes the means for positive identification of the size, type, number of conductors, and operating voltage of each cable as markings inside the lead pipe can be transferred to the jacket during vulcanization.

All TIREX Cables, and TIREX Cords too, are cured in lead. They are made in sizes and types to meet the requirements of all portable electric equipment. For a complete description of the "plus values" they provide, write us today for Folder 993.

SIMPLEX-TIREX

SIMPLEX WIRE & CABLE CO.
79 Sidney Street
Cambridge 39, Mass.

MORE OUTPUT PER DAY

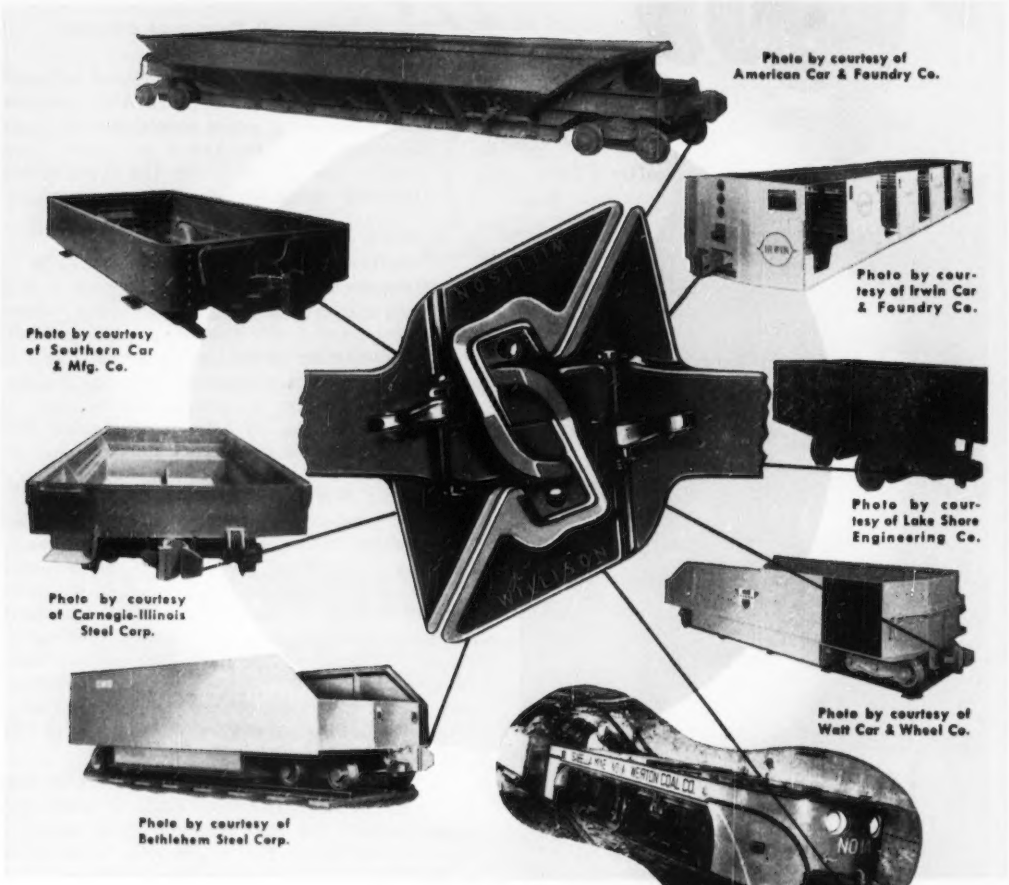


Photo by courtesy of American Car & Foundry Co.
Photo by courtesy of Irwin Car & Foundry Co.
Photo by courtesy of Southern Car & Mfg. Co.
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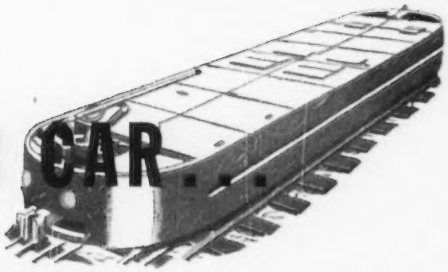
NATIONAL MALLEABLE AND

WILLISON AUTOMATIC COUPLERS • NACO STEEL WHEELS • NACO

PER MAN . . . PER CAR . . .



WITH WILLISON *automatic* COUPLERS

Large or small mine or industrial cars, in practically any kind of service, will move more tonnage per day, with maximum safety to workmen, when equipped with Willison Automatic Couplers.

For proof—ask any user about these advantages:

Maximum safety—automatic coupling requires no manual assistance. No need for workmen to go between cars when uncoupling.

Faster handling—all Willisons are alike in contour—can be coupled at either end of car or locomotive. No reversing necessary.

Smoother operation at higher speeds—close coupling eliminates damaging slack, allowing higher speeds with maximum stability and reduction of surging, spilling and danger of derailment.

To these advantages, add the substantial economies in maintenance of rolling stock, resulting from the simple, rugged construction of Willison Automatic Couplers. Two strong parts, the head and the lock, do the work and take the shocks and strains to protect cars and locomotives.

Ask for details on the application of Willison Automatic Couplers to your cars and your jobs—to enable you to handle more tonnage per day, with maximum safety.

Write for Circulars No. 1746 and No. 5240

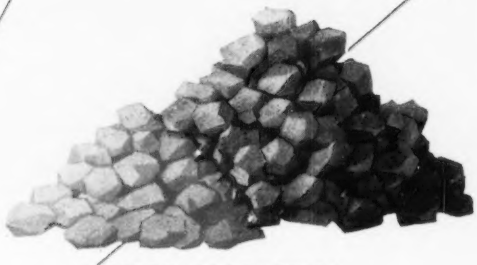
NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY
Cleveland, Ohio

NATIONAL *Products* FOR TRANSPORTATION AND INDUSTRY

STEEL CASTINGS CO.
STEEL LINKS AND SWIVEL HITCHINGS

GREATER SAVINGS

BETTER BREAKAGE



MORE PRODUCTION

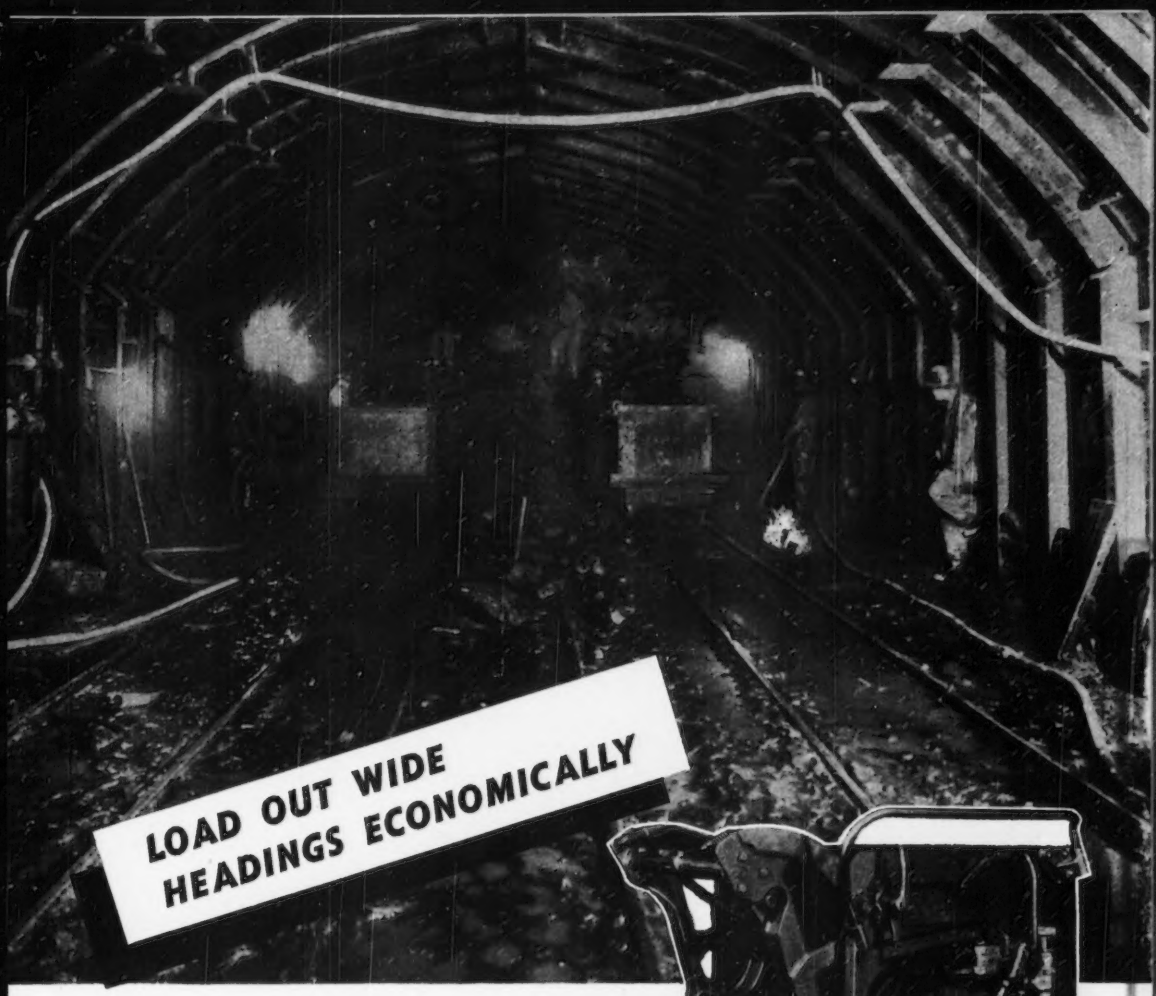
FOR LOWER BLASTING COSTS

You can save three ways by replacing older-type explosives with "Gelamites" and "Hercomites." These Hercules explosives give better breakage, greater production, and are more economical to use than extra dynamites and gelatins. Both "Hercomites" and "Gelamites" come in handy "Tamptite" cartridges. For further information, write for our illustrated booklet "Hercomites and Gelamites for Lower Blasting Costs."

HERCULES POWDER COMPANY
INCORPORATED
933 King Street, Wilmington 99, Delaware

"GELAMITE," "HERCOMITE" AND "TAMPTITE" ARE REG. U. S. PAT. OFF.

XR50-6



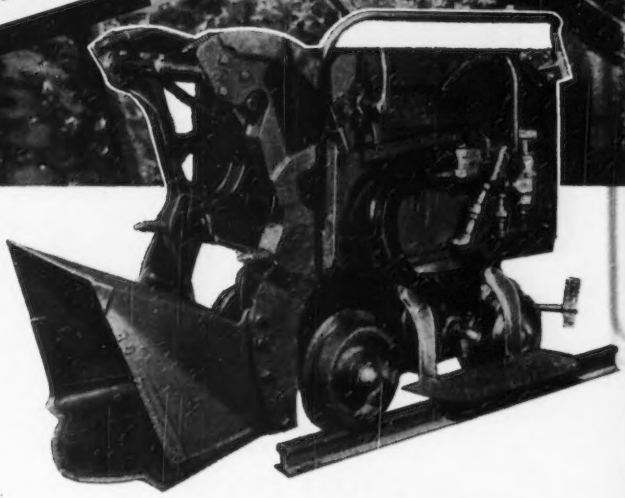
LOAD OUT WIDE HEADINGS ECONOMICALLY

For the job of mucking out big tunnels many contractors have found that it's frequently possible to make a better overall showing by using the highly efficient Eimco RockerShovel rather than large costly machines with high maintenance expense.

For every job, no matter what size rock you have, there is an efficient Eimco RockerShovel to do the loading.

Eimco's are preferred over all other types of loading equipment because they load faster, operate easier, and are much lower in maintenance costs.

Write for Bulletin L1018 on "Loading Out Wide Headings Economically."



Picture above shows contractor loading out 14' high x 25' wide heading using 2 Model 21 RockerShovels. The Model 21 (inset) is 33½" wide and 50" long (bucket up). It loads cars up to 66" above the rail, weighs 7400 lbs. and loads at the rate of 2 to 3 tons per minute.

EIMCO

A51

THE EIMCO CORPORATION

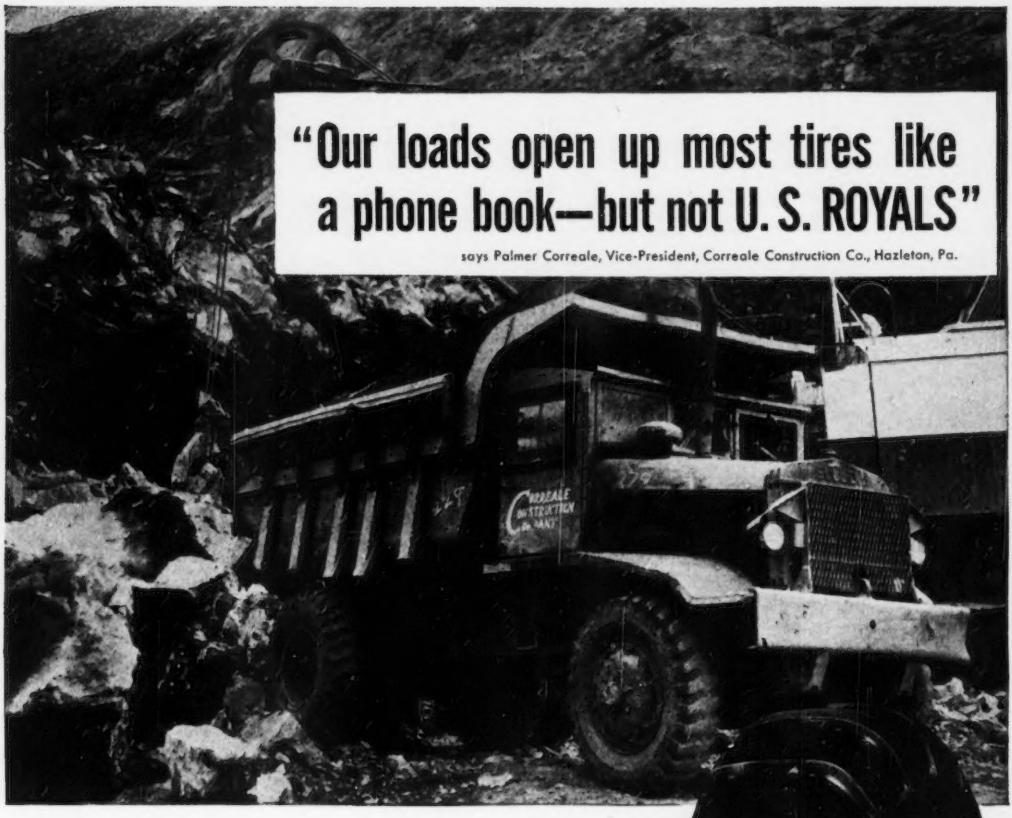
The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES: SALT LAKE CITY 8, UTAH, U. S. A.

BRANCHES: NEW YORK, CHICAGO, BIRMINGHAM, EL PASO, BERKELEY, DULUTH

AFFILIATED COMPANIES: SOCIETE EIMCO, PARIS, FRANCE; EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND

AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD



"Our loads open up most tires like a phone book—but not U. S. ROYALS"

says Palmer Correale, Vice-President, Correale Construction Co., Hazleton, Pa.

"OUR TIRES OFTEN CARRY 35-TON LOADS... IN ALL WEATHER...21 HOURS A DAY!

... Our Beechwood stripping operation is so deep that our trucks must haul coal and rock up grades of more than 10%. We cannot afford slipping, sliding or tire failure on the job. That's why we've tested and selected U. S. Royal Con-trak-tors."

U. S. ROYAL CON-TRAK-TOR. Just look at all the *extras* built right into this rugged tire:

- **CUT-RESISTING TREAD** with deep cleats gives your trucks 2-way traction.
- **ROUNDED SHOULDERS** improve flotation in soft going.
- **SHOCK PAD CONSTRUCTION** guards against rupture.

U. S. FLEET SERVICE. Your U. S. Royal Distributor is ready to draw up a tailor-made preventive tire maintenance plan designed especially for your operation—a plan which can give you lower cost per tire mile! He'll give you service where it counts—on your job! Call your U. S. Royal Distributor today. He's listed in your Classified Telephone Directory.

U. S. ROYALS

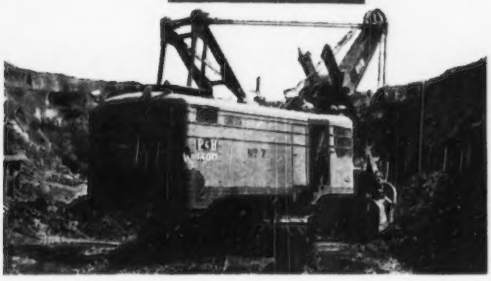
Products of
UNITED STATES
RUBBER COMPANY

U.S. ROYAL TIRES

PRODUCTION IS UP!

COSTS ARE DOWN!

WITH P&H ELECTRIC SHOVELS . . .



. . at the Steep Rock Iron Mines in Canada. Here, the first P&H Model 1400 (4 cu. yds.) was quickly followed by two more.

Bigger tonnage at lower cost . . . that's the real test. And there's where you'll find the P&H 1400 leads the way with such features as the Magnetorque* which electro-magnetically powers the hoisting motions . . . *smoother, faster,* and more *dependably.* Quicker move-ups by independent propel add *more* tonnage. Stepless electrical control saves time by eliminating *all* contactor troubles. These and many other P&H features combine to give you increased production. Greater production means greater profits for you. Write, today, for information.

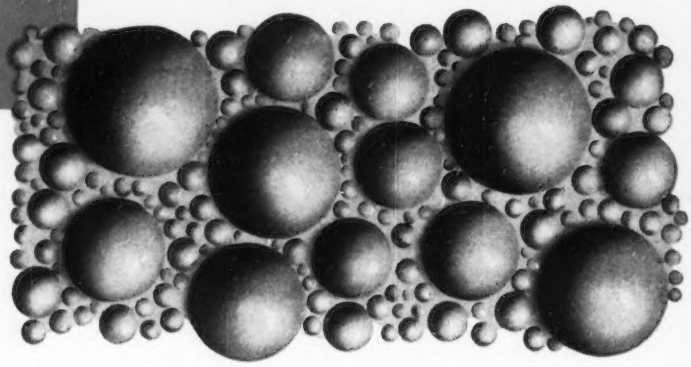
*Trade-mark of Harnischfeger Corporation for electro-magnetic type clutch.

Every third P&H electric shovel sold is a repeat order.

P&H ELECTRIC SHOVELS
4454 West National Avenue
Milwaukee 14, Wisconsin
HARNISCHFEGER CORPORATION
1911

Dependable Bear Brand Xanthates

"Over Twenty-Five Years' Experience in Producing Xanthates for Metallurgical Use."



BEAR BRAND XANTHATES AVAILABLE

- **Z-3—Potassium Ethyl Xanthate**
- **Z-4—Sodium Ethyl Xanthate**
- **Z-5—Potassium Amyl Xanthate***
- **Z-6—Potassium Pentasol Amyl Xanthate***
- **Z-8—Potassium Sec.-Butyl Xanthate**
- **Z-9—Potassium Isopropyl Xanthate**

**From Sharples Amyl Alcohols*

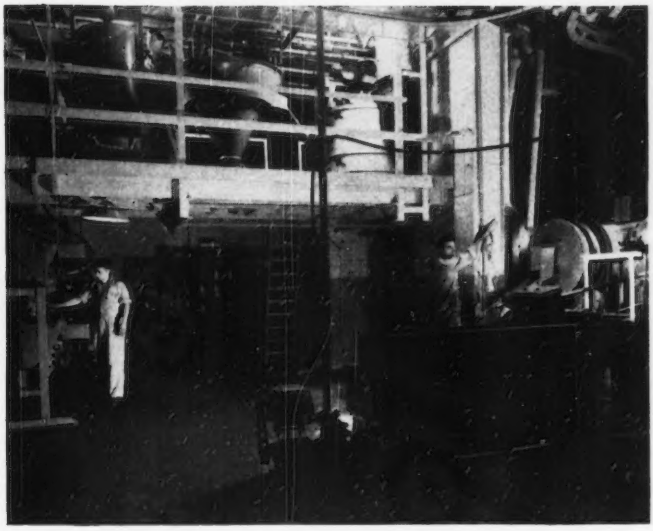
Time and experience have demonstrated that for optimum results in the flotation treatment of substantially all sulphide ores, as well as some oxidized ores and ores containing native metals, Bear Brand Xanthates are the cheapest and most efficient collectors now available.

Great Western Division
THE DOW CHEMICAL COMPANY
San Francisco 4, Calif., U.S.A.

GREAT WESTERN DIVISION · BEAR BRAND PRODUCTS · THE DOW CHEMICAL COMPANY

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

New Process Yields 90% on Low-Grade Ore



PILOT PLANT GRINDING and concentration section of Basic Industries Laboratory shows closed circuit grinding, thickening, conditioning, and flotation facilities. This section of the pilot mill can handle 15-25 tons of ore per day.

How Allis-Chalmers Basic Industries Research Laboratory Helps Solve Problems for the Mineral Industries

A MINING company wanted an economical way to recover tungsten from low-grade scheelite ore. This called for a new process, involving crushing, grinding and concentration. The company brought this problem to the Basic Industries Research Laboratory.

Batch tests were made to determine possible processes that could be used. Tests were then run in the pilot mill to further refine the process and bring out hidden factors that might have been overlooked in batch testing.

The method finally arrived at — recovery of tungsten concentrate by a combination of flotation and gravity methods — was completely successful in pilot scale tests, resulting in a process yielding 90% recovery. A-3003

THE ALLIS-CHALMERS Basic Industries Research Laboratory is primarily a service organization. It is manned by technically trained personnel and equipped with the necessary apparatus for investigating process problems that develop in the beneficiation of raw materials.

Will Mitchell, Jr. Director, Basic Industries Laboratory

Laboratory services include research on the development of new or existing industrial processes . . . research on new machinery, or improvement of old machinery . . . fundamental research into basic principles underlying modern mechanical, process or plant design.

The Laboratory's purpose is to develop new or more efficient methods... to determine the economics of processes prior to full scale production . . . to provide engineering information that will guide in the designing of efficient plants.

CAN YOU USE THIS SERVICE?

The services of the Laboratory are available to anyone in industry, regardless of the nature of their processes. All investigations are treated in complete confidence. Information obtained is not made public except with express permission of the sponsor.

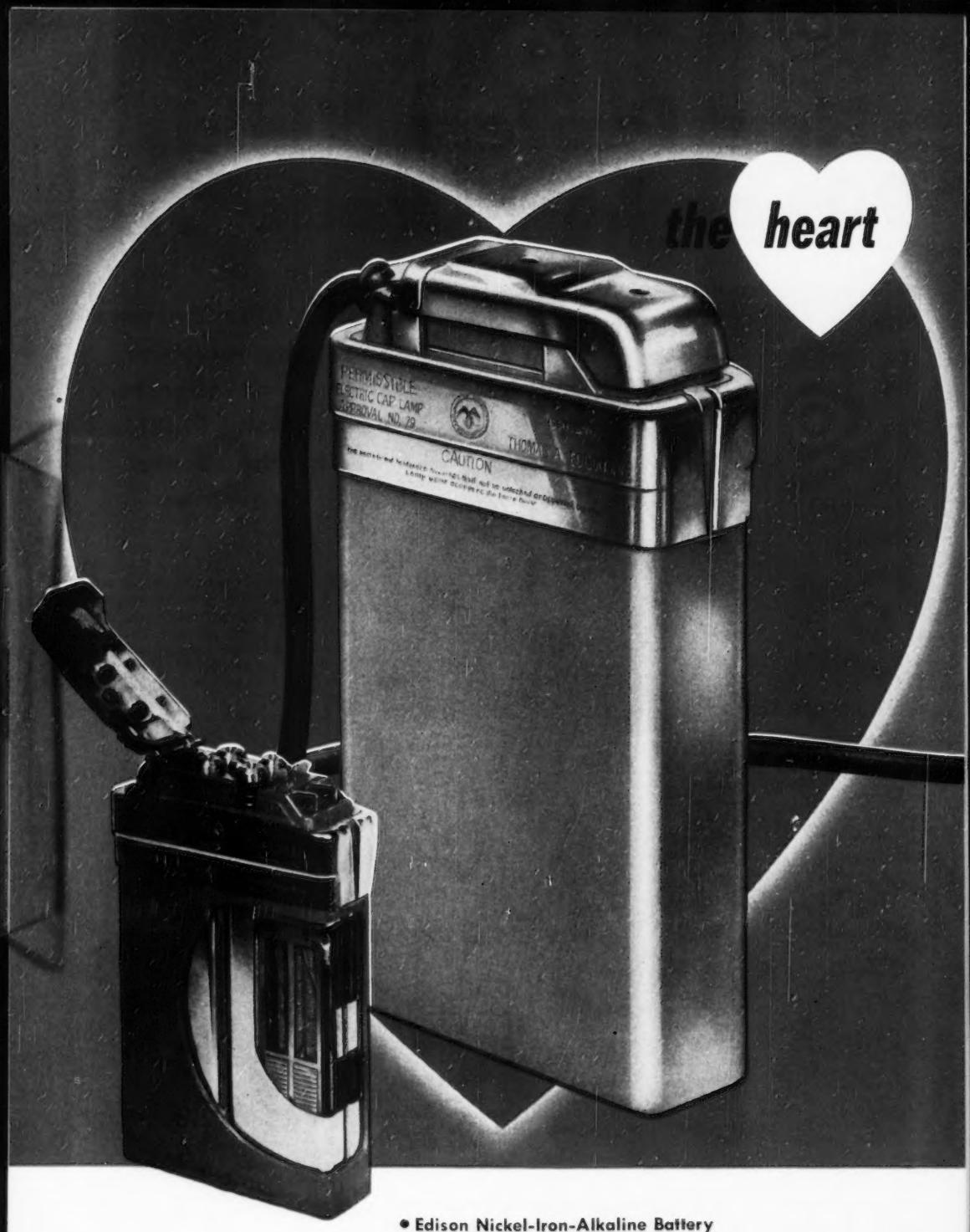
The Laboratory is a service organization; charges are based on costs. An estimate for test work can be obtained through your nearest Allis-Chalmers district office, or by writing direct to:

ALLIS-CHALMERS, 969A SO. 70 ST.
MILWAUKEE, WIS.

FROTH FLOTATION laboratory cell in concentration section of Basic Industries Laboratory is used for preliminary batch testing. PH meter in foreground provides close control of pulp acidity.

ALLIS-CHALMERS

Basic Industries Research Laboratory — Dedicated to a Better Utilization of our Raw Materials



- Edison Nickel-Iron-Alkaline Battery
- Welded Steel Cell Containers
- Tough Nylon Plastic Outer Case

# of Better Light for the miner

THE FAMOUS *Edison* BATTERY

The unfailing dependability of the Edison Electric Cap Lamp battery has been recognized since its introduction to the mining industry thirty-five years ago. Today, the Edison nickel-iron-alkaline battery continues to lead in every detail of construction and performance.

More light than ever before obtainable in a miner's lamp is a feature of the new Edison R-4 Battery. Cased in tough nylon plastic, with outer parts of stainless steel, the R-4 Battery is armored against rough usage. It is compact, well-balanced and easy to wear. *May we arrange an underground demonstration?*

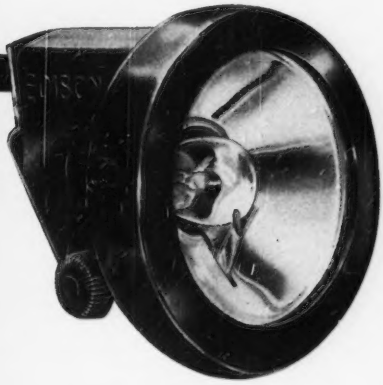
EDISON

MODEL

R-4

ELECTRIC CAP LAMP

Approved by U. S. Bureau of Mines



- **Two-Filament Bulb**
- **Positive "Spot" Adjustment**

MINE SAFETY APPLIANCES COMPANY

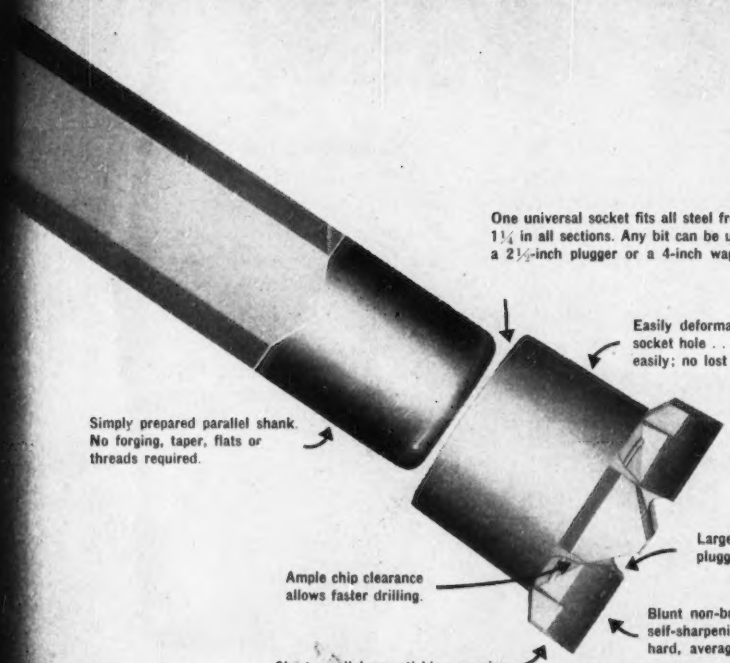
BRADDOCK, THOMAS AND MEADE STREETS . . . . . PITTSBURGH 8, PA.

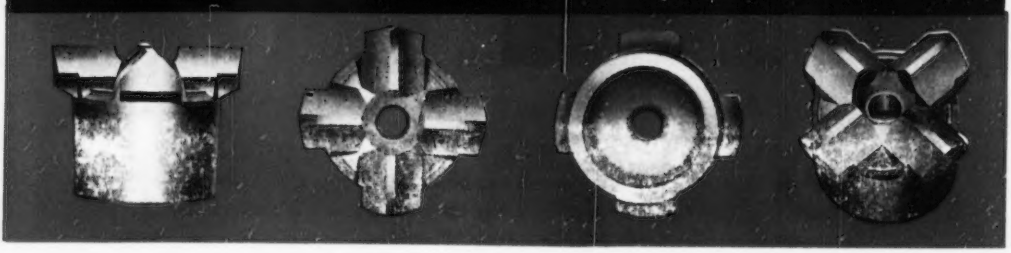
At Your Service: 48 BRANCH OFFICES in the UNITED STATES

MSA SAFETY EQUIPMENT HEADQUARTERS

THROWAWAY

DETACHABLE ROCK BITS


One universal socket fits all steel from ⅞ to 1¼ in all sections. Any bit can be used with a 2½-inch plugger or a 4-inch wagon drill.
Easily deformable skirt with close tolerance socket hole . . . bit goes on easily; comes off easily; no lost time with stuck bits.
Simply prepared parallel shank. No forging, taper, flats or threads required.
Large hemispherical non-plugging water outlet.
Ample chip clearance allows faster drilling.
Blunt non-breaking cutting edges have self-sharpening tendency—are uniformly hard, averaging 64 Rockwell C.
Short parallel non-sticking reaming sides allow close gauge following.



Case History Number 5

WOOD & McCLAY LIMITED

MINING ENGINEERS — CONTRACTORS

J. E. R. WOOD — S. J. O. McCLAY

206 FRASER BLDG.
540 SEYMOUR STREET
VANCOUVER, B.C.

February 20th, 1950.

Throwaway Bit Corporation,
4200 N.W. Yeon Avenue,
Portland, Oregon.

Dear Sirs:-

We are pleased to advise you of the results we have obtained since using your THROWAWAY Detachable Rock Bits in highway rock cuts and general construction work.

In the past we have used pretty well every type of bit on the market with varied degrees of success. Previously we used a well known make of one pass bit for our jackhammers and an equally well known make of threaded re-sharpenable bit for our wagon drills.

We have drilled well over 50,000 feet with your bits since we started using them and we have now standardized on Throwaways for both jackhammers and wagon drills.

The following is a comparison between Throwaway bits and those used previously:-

JACKHAMMERS

Previous one pass bits averaged.....2 feet
Throwaway Bits averaged.....8 feet

WAGON DRILLS

Previous re-sharpenable bits averaged..... 6 feet
Throwaway Bits averaged.....18 feet

This drilling was carried out in quartzite inter-bedded with harder bands.

From out experience with your product we have no hesitancy in advising we are obtaining a minimum of from 3 to 4 times the footage and life together with a much freer drilling operation than heretofore obtained.

Yours very truly,

WOOD & McCLAY LIMITED

S. J. O. McClay

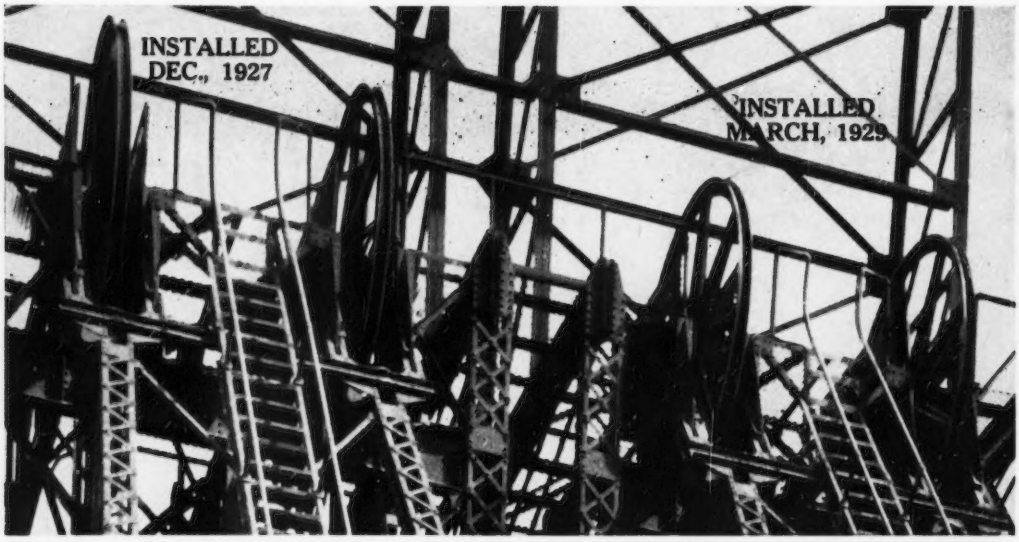
It is the company's policy to avoid grandiose, unsubstantiated claims and to offer results of actual production runs in well known mines, quarries and contracting projects as these become available. Furthermore, the company's metallurgical laboratory, backed by their field men, is constantly endeavoring to give the industry better, faster, further and easier drilling at lower cost per foot with either steel or carbide bits or both.

Fully descriptive literature on all products is available. Competent field engineers and dealers are always at your service.

THROWAWAY BIT CORPORATION

4200 N.W. Yeon Ave. — Portland, Oregon, U.S.A.

Throwaway Bits, methods of manufacture, etc., and the name Throwaway are covered by patents already issued, applications for patents, design patents, trademarks, etc. Any infringement will be prosecuted to the full.



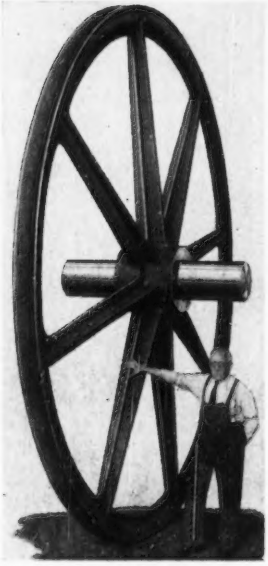
THESE VULCAN ALLCASTEEL SHEAVES
Still Show No Visible Wear

After more than twenty years of continuous service at a well-known anthracite shaft, noted for fast hoisting, the four Vulcan Allcasteel Sheaves shown above still show no visible wear and have never required any attention beyond periodic inspection and lubrication. So satisfactory has been their service, in fact, that all other shafts operated by this large company are now similarly equipped.

Besides being light and very strong, Vulcan Allcasteel Sheaves are so highly resistant to rope wear that NO LINERS ARE NEEDED. The groove maintains its original correct shape indefinitely—thereby eliminating the destructive grinding and pinching of wire rope so often caused by soft, easily worn, sheaves and greatly prolonging its useful life.

Mining men are conservative and acceptance of Vulcan Allcasteel Sheaves came slowly at first but has gained momentum so rapidly that our list of "Repeat" users now includes a large percentage of the leading companies in both the coal and metal-mining fields. Available in any size, with either plain or anti-friction bearings, they have thoroughly established their money-saving superiority for every type of heavy-duty service.

Bulletin A-396, twenty fully-illustrated pages, gives complete information. Write for a free copy and tell us about any present or prospective sheave-wheel requirement.



One of seven 14-ft. dia. Allcasteel Sheaves furnished to a well-known metal-mining company.

Vulcan Iron Works

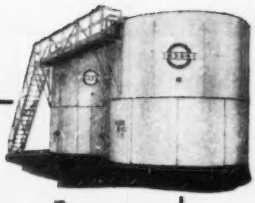
Established 1849

WILKES-BARRE, PA., U.S.A.

Cable Address "Vulworks Wilkes-Barre"

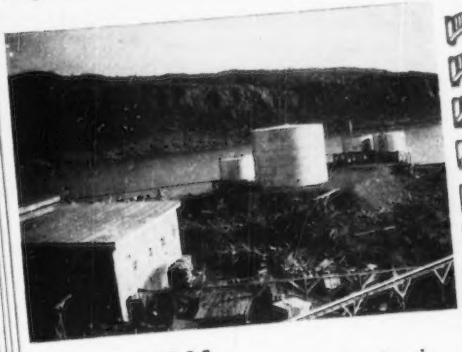
Other Vulcan products for the mining industry include all types and sizes of Electric Hoists, Cages and Skips, Shaking-Chute Conveyors, Chain Conveyors and Electric Locomotives for Underground Haulage. Bulletins mailed on request.

B S & B Bolted Tanks



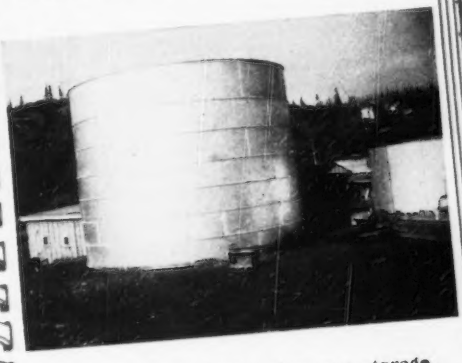
. . . pack 'em in a plane, slide 'em in a sled, cart 'em in a canoe . . .

Quick, Safe Storage Anywhere



RADIUM . . . near the Arctic Circle on Great Bear Lake! Far into the wilds . . . but not too far for the Black, Sivalls & Bryson Sales Engineer. By barge, by canoe and by sled, even by plane, parts were assembled for the Bolted Tanks serving this El Dorado Gold Mines location.

Though the trip took two months, erection was speedy, even with untrained help. Arctic storms, freezes and thaws have failed to affect its tightness. Yes,



BS&B Bolted Tanks give you storage, *anywhere!*

Remember, here's the tank that can go wherever you can go. And they've proved their versatility . . . on oil, water, aviation gasoline, even grain and cement!

Soundly engineered, weather-proof and tight against leaks. Standard sizes from 100 to 10,000 barrels capacity.

MAIL COUPON NOW

. . . get the complete story for yourself!

EXPORT SHIPMENTS A SPECIALTY

BS&B BOLTED TANKS

BLACK, SIVALLS & BRYSON, INC., Section BTM-9
720 Delaware Street, Kansas City 6, Mo.

Send me full particulars concerning the use of BS&B Bolted Tanks in my business. We do ..... mining.

NAME .....

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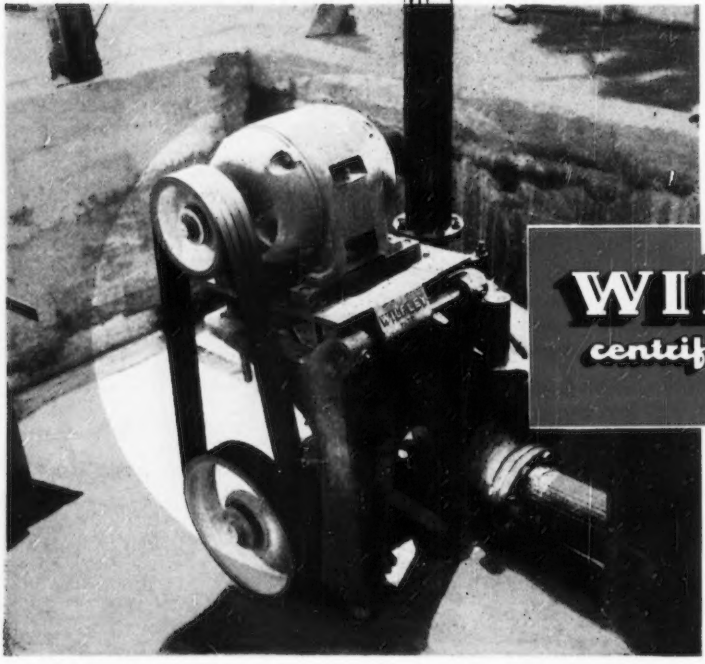
CRUSHED ROCK

In a recent government dam project, our engineers recommended and installed a 5 inch Overhead V Belt driven WILFLEY Sand Pump (illustrated below). This unit efficiently handles 550 GPM of minus ¼ inch crushed rock, 50 per cent solids and 55 foot head.

- Continuous trouble-free operation
- Cost-reducing performance
- Stepped-up production

In similar projects all over the world, you'll find dependable WILFLEY Sand Pumps right on the job stepping-up production, operating continuously and delivering true high efficiency, with consequent power-and cost-savings. There is an economical WILFLEY Pump size for every pumping requirement. Individual engineering on every application. Write or wire for details.

Buy WILFLEY for Cost-Saving Performance



Companion to the famous WILFLEY Acid Pump

WILFLEY
centrifugal PUMPS

A. R. WILFLEY and SONS, Inc.
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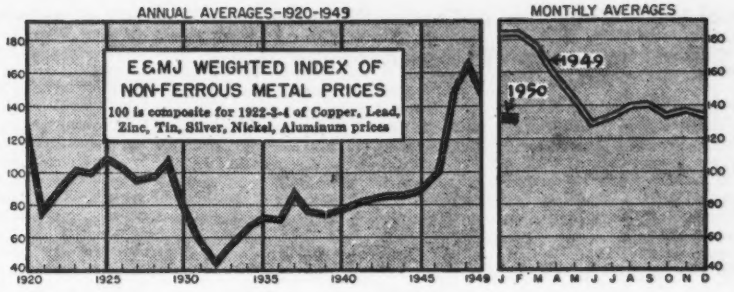
New York Office:
1775 Broadway • New York City

E&MJ OUTLOOK

PRICES



●

MARKETS

Continued weakness in the tin price shaved a few points off the E&MJ index of non-ferrous metal prices. February's index eased to 135.65 from 135.86 in January.

Optimism over an impending long-term stockpiling contract for tin melted away late in February when the British turned down the deal over the question of price. The market is now as unsettled as ever.

Talk of a higher copper price dried up slowly in February, but the prospect indicates a stable market for some months. Despite a flurry last month in lead sales, the market grew definitely weaker as February ended. **Zinc suffers** by reason of the coal strike. Galvanizers, despite the continuing demand for their products, will go slow until the strike ends.

●

LABOR

The CIO dropped Mine, Mill on schedule on charges of Communist domination. (See p.90). Many former Mine, Mill locals turned promptly to Phil Murray's Steelworkers union. Question is, will that mean eventual industry-wide bargaining, tied to steel?

●

AT HOME

Subsidies, not tariff increases, will be the Administration's answer to complaints that resurgent European production is hurting domestic industry. State and ECA suggest special relief for affected home industries. Congress and voters will frown on the whole idea of using taxpayers' funds to subsidize foreign competition.

Prospects of S. 2105 (the O'Mahoney mine subsidy bill) have shot up and down lately like a malaria patient's fever chart. At press time, Rep. Cox (Dem. Georgia) had blocked House passage with a motion to reconsider. It couldn't come up again until the Speaker of the House recognizes the Bill's sponsor. He could do that any time.

For a good metal market barometer, watch Congress' appropriations for stockpiling metals next year. Copper and lead might be affected most, but zinc could be touched by mid-summer; that's when the last of the Government's stock of zinc concentrates will be smelted.

The Geiger counter is now airborne, say U. S. G. S. geologists, who can now look for uranium from airplanes. The gadget weighs about 1,400 lb.

●

ABROAD

Effect of the British election on metal industries won't be clear until a stable government is established. It seems certain, however, that British socialism has lost much ground. Labor's narrow margin of victory, perhaps too narrow to be workable, gives no comfort to champions of governmental ownership and control of the means of production.

MARKETS—Trends and Prices

Danger of Work Stoppages in Copper Diminish and Supply Outlook Improves—Tin and Antimony Lower

CONCLUSION of labor agreements in the copper section of the non-ferrous metals industry removed the threat of work stoppages in that important area and eased the tension that disturbed both buyers and sellers. However, the critical coal situation and the strike at the Chrysler plants continued throughout February and made for increased caution and some slackening in sales activity.

Slightly lower monthly averages for zinc and tin caused the E & M J index of non-ferrous metal prices to decline from 135.86 in January to 135.65 in February. Copper, lead, silver and aluminum were unchanged. Antimony and platinum prices declined.

Industrial production in the United States for January was estimated at 182% of the 1935-39 average, according to a preliminary report issued by the Federal Reserve Board. This compares with 179% in December and 191% in January a year ago.

Copper Fairly Active

Fabricators purchased close to 100,000 tons of copper for February delivery, yet the expected squeeze in supply did not materialize. Demand for March copper was good, but buying interest in April forward appeared to be on the quiet side. With production likely to increase and imports continuing at a good rate, consumers were not concerned over the supply situation. Scrap copper has been coming out from hiding, indicating that holders have given up the idea of a higher price.

The January statistics of Copper Institute were favorable. Figures for January, along with corrected statistics for December, in tons, follow:

United States

Production:	(a) Dec.	Jan.
Crude, primary	71,864	73,698
Crude, secondary	8,526	11,914
Totals, crude	80,390	85,612
Refined	94,947	95,229
Deliveries, refined	107,662	111,668
Stocks, refined	116,027	101,070

Outside United States

Production:	(a) Dec.	Jan.
Crude, primary	97,156	106,244
Crude, secondary	975	1,898
Totals, crude	98,131	108,142
Refined	83,261	87,923
Deliveries, refined	77,604	81,574
Stocks, refined	147,972	142,971

(a) Corrected figures.

Statistics issued by the fabricators of copper attracted wide interest. Copper contained in products shipped by fabricators during December declined unexpectedly to 83,437 tons (revised). The figures for January showed shipments of 108,921 tons, which was more in line with the deliveries by producers to the fabricating division. Stocks of refined copper in the hands of fabricators at the end of January amounted to 354,487 tons, which compares with 354,992 tons a month previous and 364,656 tons a year ago.

Split on Copper Duty

Opinion on prospects for extending the period of free entry of foreign copper varies. Legislation now in force calls for the reimposition of the duty on June 30, 1950. Representative Patterson (Conn.), speaking largely for the fabricators, favors the continued suspension of the duty and he has introduced a bill in Congress that would extend the period of exemption. Those who back the 2c. tax are concerned over the business outlook and fear that reduced consumption and increased competition may result in lower prices.

The market has been absorbing more than 100,000 tons of copper a month over the first two months of the year and the industry believes that this high rate of consumption will continue throughout March and possibly longer. The stockpile purchases are not included in these figures and account for 10,000 tons or more a month. During the first two months of 1950 the price, here as well as abroad, has been remarkably stable, averaging 18½c., Valley, on domestic business, and 18½c., f.a.s. New York equivalent on foreign sales.

Copper imports of the United States in December and the 12 months ended December, in tons, according to the Bureau of the Census:

	Dec. 1949	Jan.-Dec. 1949
In ore, matte, etc.	11,593	117,716
Blister (content)	28,369	152,374
Refined copper	19,843	276,808
Old, scrap (content)	696	6,799
Comp. metal (content)	217	2,266
Brass scrap (content)	4,054	15,390

Exports of refined copper of the United States in December totaled 22,434 tons, making the total for the twelve months ended December 137,267 tons.

Lead Unsettled

Though consumers view the supply situation as easier, they purchased fair tonnages during the last month. The buying was quite general in character and confirmed the belief entertained by producers that stocks in the hands of consumers were on the light side. Producers encountered no difficulty in maintaining the price at 12c. a pound, New York. Sales of lead to the Government for its stockpile helped to sustain values. Foreign lead was offered freely at prices somewhat below domestic parity.

Speaking before the Colorado Mining Association on Feb. 3, Felix E. Wormser, vice president of St. Joseph Lead Co., asked for adequate tariff protection on both lead and zinc to offset "the detrimental influence of devaluation of foreign currencies on the domestic mining industry." He favors a graduated import duty whereby the tax would be greatest when the domestic price is low and disappears altogether when high.

Imports of refined lead in December amounted to 23,158 tons, making the total for last year 285,241 tons.

The Department of Justice has filed a suit alleging violations of the Anti-Trust Act against the Association of American Battery Manufacturers, 22 companies and 24 individuals. The defendants were charged with conspiring in the sale and distribution of used storage batteries. The plan under

Average Prices for February (E&MJ Quotations)

Copper:	
Electrolytic, Domestic, Refinery	18.200
Electrolytic, Export, Refinery	18.425
Lead:	
Common, New York	12.000
Common, St. Louis	11.800
Silver and Sterling Exchange:	
Silver, New York, per oz.	73.250
Silver, London, pence per oz.	64.000
Sterling Exchange, "Checks"	279.750
Zinc:	
Prime Western, East St. Louis	9.750
Tin:	
New York, Straits	74.352
New York, 99% min. (e)	73.352
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$71.000
Antimony, (E&MJ) (d)	30.598
Antimony, bulk, Laredo	27.318
Antimony, in cases, Laredo	27.818
Platinum, refined, per oz.	$66.000
Cadmium, (a)	200.000
Cadmium (b)	207.500
Cadmium (c)	215.000
Aluminum, 99% plus, ingot	17.000
Magnesium, ingot	20.500
Nickel (f)	40.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange, checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers' quotation.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lot packed in cases, f.o.b. New York.

(e) Tin contained.

(f) F. o. b. Port Colborne, U. S. duty included.

attack is said to cover every step in the economic travels of a battery. The importance of battery scrap to the entire lead industry is indicated in the November statistics of the Bureau of Mines which showed total receipts of lead-base scrap by smelters of 43,271 tons, of which 23,865 tons consisted of battery plates.

Production of slab zinc in the United States in January totaled 69,948 tons, against 71,327 tons in December. Total shipments came to 82,576 tons, of which 69,020 tons was for domestic account, 402 tons for export and 13,154 tons went to the Government. Increasing nervousness over the coal situation late in the month was reflected in reduced purchases of zinc for galvanizing. Die casters were less active because of the strike at Chrysler.

Prime Western zinc continued at 9¾c. per pound, East St. Louis throughout the month.

Export business in zinc was slow, with sellers of Prime Western on the basis of 9¼c. per pound, f.a.s. Gulf ports.

Tin prices were unsettled as the month ended on renewed selling pressure following the failure of the British and United States authorities to come to an agreement on the sale of metal for the stockpile. The next important move in tin is expected to come out of the meeting in Paris on March 20, at which the buffer pool and other arrangements will be discussed with a view toward stabilizing the market.

Antimony was lowered to 27¼c. per pound, carload lots, f.o.b. Laredo.

(Continued on page 88)

Major Metals

U. S. DAILY AND AVERAGE PRICES

Feb. 1950	Electrolytic (a) Domestic	Copper (b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
Feb. 1950						
1	18.200	18.425	74.250	12.000	11.800	9.750
2	18.200	18.425	74.375	12.000	11.800	9.750
3	18.200	18.425	74.375	12.000	11.800	9.750
4	No Market	18.425	74.375	12.000	11.800	9.750
6	18.200	18.425	74.375	12.000	11.800	9.750
7	18.200	18.425	74.500	12.000	11.800	9.750
8	18.200	18.425	74.500	12.000	11.800	9.750
9	18.200	18.425	74.500	12.000	11.800	9.750
10	18.200	18.425	74.375	12.000	11.800	9.750
11	No Market	18.425	74.375	12.000	11.800	9.750
13	Holiday	18.425	Holiday	Holiday	Holiday	Holiday
14	18.200	18.425	74.500	12.000	11.800	9.750
15	18.200	18.425	74.500	12.000	11.800	9.750
16	18.200	18.425	74.500	12.000	11.800	9.750
17	18.200	18.425	74.500	12.000	11.800	9.750
18	No Market	18.425	74.500	12.000	11.800	9.750
20	18.200	18.425	74.375	12.000	11.800	9.750
21	18.200	18.425	74.250	12.000	11.800	9.750
22	Holiday	18.425	Holiday	Holiday	Holiday	Holiday
23	18.200	18.425	74.125	12.000	11.800	9.750
24	18.200	18.425	74.125	12.000	11.800	9.750
25	No Market	18.425	74.125	12.000	11.800	9.750
27	18.200	18.425	74.125	12.000	11.800	9.750
28	18.200	18.425	74.125	12.000	11.800	9.750
AVERAGES FOR MONTH						
Feb.	18.200	18.425	74.362	12.000	11.800	9.750
AVERAGES FOR WEEK						
Feb.						
1	18.200	18.425	74.542	12.000	11.800	9.750
8	18.200	18.425	74.417	12.000	11.800	9.750
15	18.200	18.425	74.450	12.000	11.800	9.750
22	18.200	18.425	74.425	12.000	11.800	9.750
CALENDAR WEEK AVERAGES						
Feb.						
4	18.200	18.425	74.396	12.000	11.800	9.750
11	18.200	18.425	74.438	12.000	11.800	9.750
18	18.200	18.425	74.500	12.000	11.800	9.750
25	18.200	18.425	74.200	12.000	11.800	9.750

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West command a premium of 1.10c. per pound over the current market for the Prime Western; Special High Grade 1.25c.

Quotations for lead are for common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and one-eighth cent fractions per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance for carrying, delivering, and marketing. In addition to foreign silver, the quotations also apply to domestic and Treasury silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Feb. 1950	Sterling Exchange "Checks"	Silver (c) New York	Silver (c) London	Gold London	Gold (d) United States
Feb. 1950					
1	279.750	73.250	64d.	248s.	$35.00
2	279.750	73.250	64d.	248s.	35.00
3	279.750	73.250	64d.	248s.	35.00
4	(e)	(e)	(e)	(e)	35.00
6	279.750	73.250	64d.	248s.	35.00
7	279.750	73.250	64d.	248s.	35.00
8	279.750	73.250	64d.	248s.	35.00
9	279.750	73.250	64d.	248s.	35.00
10	279.750	73.250	64d.	248s.	35.00
11	(e)	(e)	(e)	(e)	35.00
13	Holiday	Holiday	64d.	248s.	Holiday
14	279.750	73.250	64d.	248s.	35.00
15	279.750	73.250	64d.	248s.	35.00
16	279.750	73.250	64d.	248s.	35.00
17	279.750	73.250	64d.	248s.	35.00
18	(e)	(e)	(e)	(e)	35.00
20	279.750	73.250	64d.	248s.	35.00
21	279.750	73.250	64d.	248s.	Holiday
22	Holiday	Holiday	64d.	248s.	35.00
23	279.750	73.250	64d.	248s.	35.00
24	279.750	73.250	64d.	248s.	35.00
25	(e)	(e)	(e)	(e)	35.00
27	279.750	73.250	64d.	248s.	35.00
28	279.750	73.250	64d.	248s.	35.00
MONTHLY AVERAGES					
Feb.	279.750	73.250	64d.	—	35.00
AVERAGES FOR WEEK					
Feb.					
1	279.750	73.250	—	—	—
8	279.750	73.250	—	—	—
15	279.750	73.250	—	—	—
22	279.750	73.250	—	—	—

Calendar week averages: New York Silver: Feb. 4th, 73.250; 11th, 73.250; 18th, 73.250; 25th, 73.250.

(e) No market (Saturday).

Behind the By-Lines . . .

G. P. Lutjen

» **If, as an engineer,** you've ever wondered what you have been doing all these years, we've got an answer for you—and we quote:

"By habitual search for Basic Truth through empirical contacts with Nature's Immutable Manifestations of forces and materials, The Engineer aptly conjures hidden vital verities and brings forth the fruits of his labors that his group and nation may prosper."

It came by mail with the written note, "Reproduction with credit granted." So, please credit **Hugh A. Brown, Electrical and Power Machinery, Douglaston,** New York.

» **It's just a guess,** but we'll bet that **Walter A. Rukeyser's** middle initial stands for "Asbestos." In his 30 years in the asbestos industry he has chalked up quite a record. He was directly or indirectly responsible for putting into production the only three new Canadian plants since World War I. He designed and erected the first mill for the Arizona asbestos deposits. Three times the Soviet Union retained him during the first Five-Year Plan. Over at Uncle Joe's, he first designed a 2,400-ton-a-day mill. On the second trip he made a critique of their asbestos and milling industry. Then he helped with mechanization.

Mr. Rukeyser also served as an officer in the U. S. Navy in two wars, so you can un-arch your eyebrows. As we see it, he is qualified to talk about Canadian asbestos, and so he does on page 76.

» **Depending on** whether you are a geologist or an economist, this is the story of a good man gone wrong or a sinner redeemed. **Mord Lewis** started with Anaconda as a geologist in Butte. Dickering with ore reserves, claims, mine evaluation and similar items that geologists customarily dicker with, he got a working knowledge of a mine's real assets and liabilities.

We next see Mr. Lewis with the RFC. There he found that he could handle fiscal matters as easily as he did synclines and peneplains. Before long he was back with Anaconda, in New York now, instead of Butte, and chopping chips off taxes instead of off rocks. In writing an article like "What You Should Know About Depletion Allowances" (p. 60) it seemed logical to go to Mord Lewis for the facts.

» **Here is an interesting** offer for a college to take up. **George A. Packard,** Boston mining engineer, writes:

As I am retiring from active business you may stop (sending) my Engineering & Mining Journal . . . when the present subscription expires.

I regret doing this as I have been subscriber for 60 years but my eyes are not what they were. I have all the numbers, unbound, for this entire period and am inclined to present them to any college which might like them if they would come and take them away. There are a lot of valuable descriptions of old mining regions and camps now abandoned in the files of the early years.

Any institution ready to take up Mr. Packard's offer can reach him at 53 State St., Boston, Mass.

Wonder how tall a stack 60 years of E&MJ would make?

» **As Babe Ruth or William Shakespeare** or someone once said, "The road to Hell is paved with good intentions." If this is true, our own good intentions will account for a six lane highway.

For six months now, we have wanted to put in a paragraph about John Lewis and Frank Parsons. Back in October they won the world's championship hard rock drilling contest held at Mojave, Calif. This team, employees of Pacific Coast Borax Co.'s Boron (Calif.) workings, drilled through 36 in. of "live rock" and dismantled the nine separate pieces of their equipment in five minutes and one second, cutting 16 seconds off the existing record. Under actual working conditions this drilling operation usually takes about 45 minutes. Messrs. Lewis and Parsons are now ready for extra long lunch hours. Contest prize money was $325.

» **The juggling act** going on in the New Products Digest with the reply cards is the result of a recent scrape with the Postal Authorities—just in case you were wondering. You may recall that in January we ran a card insert in Provocative Pink. A goodly number of people used the card to get further information on new products and everything seemed copasettic.

The rude awakening took the form of a highly indignant letter from Postmaster General Donaldson's Chicago agent. According to the fine print in an obscure section of the postal law, if we make arrangements for having a whole page torn out by the reader, we lose second class mailing privileges. That little card counted as a page and we were about to lose our shirts. In the nick of time we switched from a similar card to a page corner in the February issue. For March we gave the problem some sober thought. For the results of sober thinking turn to page 103.

» **"Gee Whiz"** seems to be the standard reaction of most people to this bit of intelligence.

Oil drillers have gone down to a depth of 30,521 ft. in Wyoming for a new depth record. In such wells, miles of steel drill pipe must act as a drive shaft for the drill bit at the well bottom. Twisting stresses are enormous, but so is the steel's ability to absorb them. When power is applied to the top end of even a 10,000-ft. string of pipe, oil men calculate that the top end will make at least eight full turns before the drill at the bottom begins to rotate.

» **Some figures** in a recent survey ought to be the basis for some very interesting speculation. According to the report, national per capita consumption of alcoholic beverages is $59.59, while for milk the figure is only $32.24—that's without chaser, of course.

ENGINEERING AND MINING JOURNAL

MARCH, 1950

Help Now—Don't Cry Later

AS WE SAID on our editorial pages for December and January, and as we say again on pages 56 to 59 of this issue, the future of mining as an efficient, private enterprise industry is being undermined by taxes that do not give the investor in new mining ventures a run for his money.

Your help in righting that wrong is needed now.

The mining industry can reach the tax goals set by the National Minerals Advisory Council if enough men like you will simply write a few letters, then get others to do the same. Your case has merit. Don't let it be said that it was lost because you wouldn't lift a finger to help your industry toward a sound future.

Mining Has An Interest In ECA

QUITE EVIDENTLY, most people engaged in domestic mining are opposed to continuation of the European Recovery Program. They view this program as impracticable, Europeans as insincere, and the stimulation of certain foreign mineral developments as a subsidy to their own competitors.

There seems little realization of the benefits domestic producers themselves have enjoyed under the Marshall Plan's operation.

In scrutinizing the actions of the Economic Cooperation Administration that relate to mining, it should be kept in mind that the purpose of the Marshall Plan is to protect our own security and well-being by helping to restore normalcy and drive out Communism in Western Europe. Stimulation of mining developments has been purely tributary to that aim, and mainly designed to help make Europe more self-sufficient.

Another motive has been to improve the strategic and critical material supply for the United States. If materials had not been in short supply at the time the law was made, these features would probably not have been written. But they were, and Congress therefore instructed the Administrator to:

"Promote an increase in the production in such participating country of materials which are required by the United States as a result of deficiencies or potential deficiencies in the resources within the United States."

Congress also had a desire to obtain repayment in materials for some of the outpouring of taxpayers' funds. These repayments were channeled to the stockpile and not to domestic markets.

However, the principal effect of the ERP as applied to domestic mining, has been the support given to domestic metal and mineral markets by removing from them approximately 28,000 tons of copper, 8,000 tons of lead, and 12,000 tons of zinc per month. Moreover the ECA has delivered to Europe from Western Hemisphere sources more than $1,170,000,000 worth of machinery and vehicles, $70,000,000 worth of non-metallic minerals, and $70,000,000 worth of metallic ores and concentrates. Nobody can state with certainty the effect of this movement on prices, but we believe that prices of copper, lead, and zinc would have averaged at least one cent a pound lower these past two years had it been absent.

The domestic mining industry's chief stake in the ECA is its important interest in the rehabilitation of Europe as a consuming area. The world's bonanza mines are going to keep on producing, willy-nilly, and it is hopeless to try to erect fences high enough to shut them out of the United States if they cannot find markets in foreign areas that normally take their output.

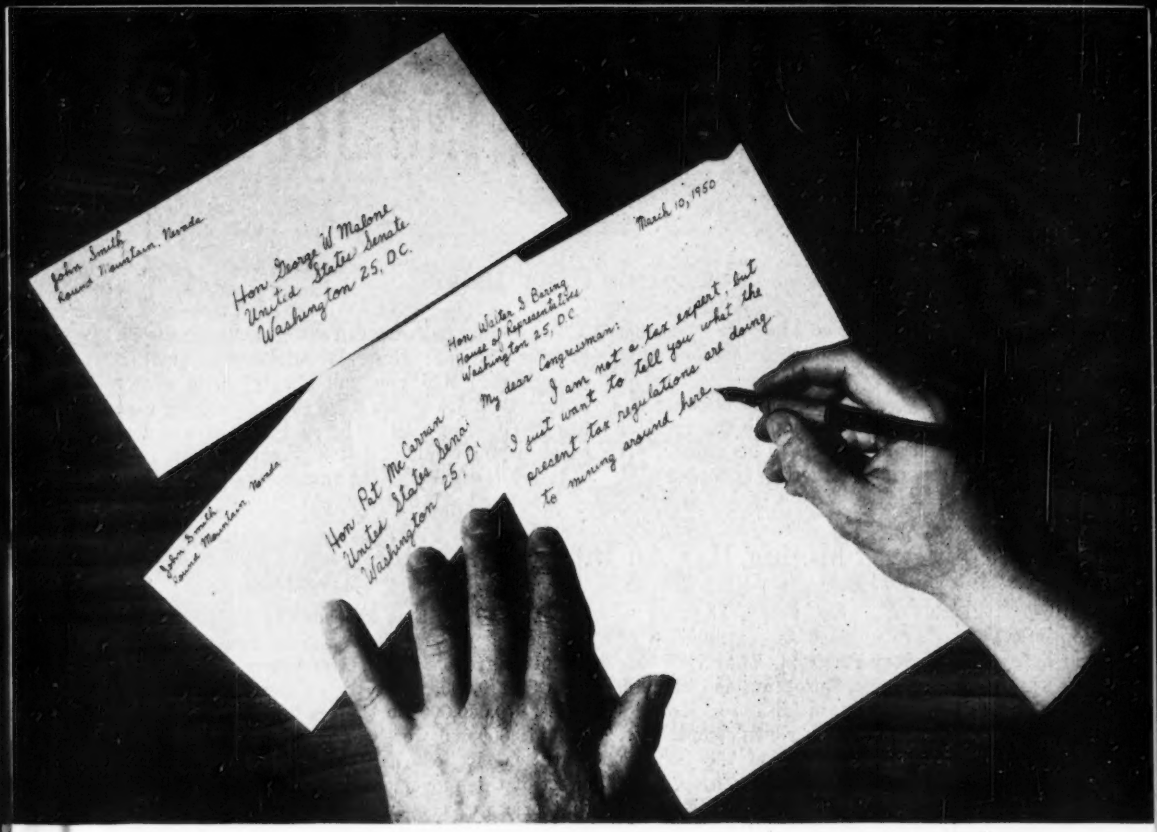
Also, if world markets are restored and resume normal growth, as indicated by Mr. Shea's article in this issue, not all the world's mines now able to produce could meet the demand for metals.

All the foregoing concerns the special interests of the mining industry. As individuals we have other interests. Without being able to judge how much longer Marshall Plan aid can be successfully applied, we can assert the following without qualification:

1. The ERP stopped Communism in Western Europe in 1948.

2. The idea that the Europeans are callously playing us and the Communists off against each other is a complete myth.

3. If Communism overtakes Europe, as it seems to be doing in Asia, the Western Hemisphere will face armament costs that will make our present burdens seem light indeed.



WRITE THREE LETTERS, one to each of your senators and one to the congressman from your district. Tell them in your own words that you want them to support the mine taxation recommendations of the National Minerals Advisory Council (opposite page).

Take Action on Taxation

MINING WILL go on, regardless of taxes. An industrial civilization must have its products, even if the public has to pay prices higher than should be paid. The choice is whether the public is to enjoy the benefits of the drive and efficiency of private-enterprise industry, or must pay for the slowness, inefficiency and indecisiveness common to all bureaucracy.

As mining is a wasting asset industry, new enterprises must be created, not only to meet expanding requirements, but to replace depleted reserves. If private enterprise is to carry forward in mining, the prospective investor in new mining ventures must have a run for his money. Otherwise the new ventures cannot be financed, and private enterprise, cut off from its roots, will wither away.

The simple but frightening truth is that the present tax system does not make adequate allowance for the risks of new mining ventures. The Government says, "Heads I win, tails you lose," and the investor looks for safety rather than a profit which he can't keep if he wins over natural odds to gain it.

There Is No Single Remedy

The flourishing mining industry that we would all like to see—and which public interest and national security demand—cannot be attained by any single stroke of legislation. But to give the investor a run for his money will do more than any other single measure, with more durable, far-reaching effects.

The pity of it is that the Treasury is so short-sighted as not to see that its aim of extracting maximum taxes from the long-suffering taxpayer would be aided, not deterred, by the growth of new enterprises. By shrinking the tax base, the burden on each unit under the load is made more unbearable. What will Uncle Sam do for taxes—and we bondholders with our bonds—when the base gets so small that added pressures shrink total revenues instead of expanding them? A bird in the hand may be better than two in the bush, but it will be a dead bird if it is not given a chance to feed itself.

Despite the truth of the above statements, the Treasury is not only willing to allow the bird to expire from lack of nourishment, but actually wants to strangle it. The Treasury has persuaded the President to attack the established basis for depletion as a particularly inequitable "loophole" in the tax

(*Continued on page* 58)

A Six-Point Tax Program to Help the Mining Industry

YOU DON'T HAVE TO BE a tax expert to tell your representatives in Washington what to do about mine taxation. Just read the following paragraphs to get a general idea of the changes needed. Whether you tackle the problem on any technical level or simply register dissatisfaction in a general way, the most important thing is that you and many others tell Congress that the folks back home expect action. If you will do this, experts can easily be provided in Washington who will translate your needs into technical terms.

Recommendations of the National Minerals Advisory Board

1. **Allowances for depletion should be made to stockholders as well as to the corporations.**

A mining operation gets a depletion allowance because it exhausts its ore reserves, the principal capital assets of the owners. But the real owner of the corporation, the stockholder, is not not allowed to make a deduction from dividends he receives, even though part of his dividends are merely repayment for depletion of his investment.

This could be corrected by simply allowing a stockholder to deduct a percentage of his mining company dividends from his taxable income that is equal to the percentage that the company's depletion allowance is of net income plus depletion allowance.

2. **Tax exemption should be granted to a new mine for at least three years after profitable operation begins.**

This recommendation is patterned after a similar law in Canada which has been a profound stimulant to new mine development. It is not a theory, but an actual practice by a government which also needs taxes, but which seems to understand that all taxes will disappear if the sources of new wealth are cut off.

This provision is of greatest interest to the small miner or prospector who needs outside capital, or whose operation is likely to have a hard time getting on its feet in the early stages. *Engineering & Mining Journal* considers five years to be a realistic period.

3. **Development costs after discovery should be recognized as operating expenses.**

The Treasury refuses to permit pre-production development costs to be treated as operating expenses, which they actually are. It insists that such costs are capital expenditures and are thus to be recovered only through depletion allowances, except if a property is abandoned. Considering that the depletion allowance is determined independently of development costs, the effect of Treasury ruling is to deny the operator his logical rights to balance expenses against gross income in computing net income. Only in the case of the major company or the individual with other sources of income is the right upon abandonment meaningful. But the operator or stockholder whose livelihood is tied up in an enterprise which fails is not likely to have other income from which he can deduct the loss claims upon abandonment.

The Council recommends that the taxpayer should have the option of charging development expenses either against current income or against income from the affected ore reserves as mined.

4. **Adequate allowances for percentage depletion should be made.**

The Revenue Code sets up tax-free allowance for depletion because a portion of mine income represents the conversion of capital assets into income. The law does not seek to tax capital assets and limits taxes on gains realized from the sale of capital assets. During the history of the treatment of depletion in the tax laws other factors have been included. These include return to the industry tax-free of the funds spent for exploration, incentives to discovery of minerals, and the recovery tax-free of the cost of acquiring a property producing the income. The Treasury has been willing to accept only the last point, but has continually resisted the right of industry to recover tax free either the value of the ore as depleted, or the cost of replacing the depleted reserves. In general these are approximately the same, with the latter tending to run higher as mineral deposits become more difficult to find.

5. **Losses from unprofitable ventures should be allowed corporations, partnerships or individuals as ordinary deductions against current income.**

On the grounds of fair play, a taxpayer should have the right to make full allowances for losses in computing taxable income. In present practice there are several limitations on that right. These should be removed, including the technical requirement that a property must be sold or abandoned before a capital loss can be claimed.

6. **Income should not be taxed without full allowance for loss years.**

As part of the principle of recognizing losses actually sustained, the losses of unprofitable years should be balanced against the income of profitable years. Otherwise, the operation which has only intermittent profits suffers from discrimination. This discrimination is particularly hard on small operators because they lack other income against which to balance losses, and on marginal operators because they have more loss years. The present law allows two years carry-forward of losses and two years carry-back. The Council recommends that carry-forward privileges should be extended to five years to allow more adequately for the unprofitable periods that occasionally develop, particularly in marginal operations.

An important feature of the carry-over privileges as presently administered is that allowances for depletion must be eliminated from both the year carried over and the year carried to. The Council position is that after the results of the two periods are combined, a depletion allowance should be computed on a normal basis.

Just Take Action

You have every right to demand action on these recommendations, both in your own and the public interest. So again we urge you—write to your congressmen and senators in Washington.

Prospector

Who will finance your prospect if investors don't get a run for their money?

Miner

Who will provide jobs and wages if Uncle Sam takes out too much in taxes?

Small Mine Operator

How will you keep going if profits are taxed, and losses not recognized?

laws. The President seems to have forgotten how hard it was to make a living when he was in the haberdashery business and under much less burdensome taxes and tax-accounting costs than those of today! When—and if—he achieves the goal of pie in the sky for everybody at nobody's expense, we or our victimized children will discover that the mining industry is inherently and inevitably individualistic. Under the bureaucratic management of a "welfare state," its products will cost the public plenty!

Thus another fight over depletion allowances in the income tax laws is under way. The mining industry is being forced to fight for its life, and you had better get into the fray!

To the Prospector

You may not have a mine yet, but simply a group of claims, or merely hope in your heart, and you may say, "But this doesn't concern me. I have no mining income, and income taxes don't bother me. Why should I fight the other fellow's battle?"

But hold on a moment, friend. Where are you going to get a grubstake if that dentist, lawyer, or grocer can't get a run for his money? Where are you going to finance a prospect? Also, if you prove up a mine, you won't want to struggle with the aches and pains of operation. You will want to take advantage of the lower tax rate on capital gains than on other income, and sell out to a large company. But how can they pay you anything worth while if they can't make a profit commensurate with the risks they take?

There are thousands like you scattered over the West, all hoping that an investor seeking a run for his money will come along and help you achieve that goal so dear to your heart. You can put this over if you will. Just buy three one-penny postcards and let your congressman and senators hear from you about this tax program.

Marginal Operators No Exception

If you are a marginal operator you might take the same view as the prospector and decide that you are not your brother's keeper. As you see it, you can't make a profit and pin your hopes elsewhere.

Well, you are a part of this industry and its future is your future. Also, if you can stay in business, you may break into the profitable class. You certainly have a stake in making the tax laws recognize fully your actual losses, which they do not now do. If you consider your operation hopelessly and irrevocably unprofitable, then we sincerely advise you to give it up, as complete dependence on bureaucracy will make you hate the day you were born.

One thing that should be emphasized is that the case for tax incentives for venture capital is a separate issue from that of direct subsidies. One is not a substitute for the other. Subsidies are nothing but a stop-gap, whereas tax improvement is fundamental. The man who would want direct subsidies to do the job of venture capital in mining, and not simply handle particular distress situations of special merit, is simply asking for a Government-run mining industry, no less. Moreover, anything that will make Congress realize the need for legislation to improve the mining picture certainly cannot hurt the drive for production and exploration incentive payments.

The Workman and His Union

It takes no scholar to understand that there is just so much pumpkin in a pie. What the Government takes, labor can't share with management and stockholders. If taxes make for a shrunken, sick industry, jobs are bound to be fewer and pay lower. The fundamental truth of this statement is beyond question.

But this pie can grow! It can grow and grow if taxes permit the mining industry to become what it should be in this country.

So, Mr. Workman, if you want low wages and excessive job com-

New Mines Must Be Financed to Replace the Old

After great mines like these are mined out, the investors will own a hole in the ground. That is why the owners and investors are entitled to adequate depletion allowances, to full recognition of actual losses, and to a run for their money in new ventures.

petition in mining, don't write your members of Congress about improving the tax picture for mining. If you want your employer to have his back to the wall when you come to him with wage, pension or working condition requests, just don't do anything about mining taxation. Then you will have a new face at the bargaining table, one which rules the roost—sheer economic necessity. No one ever drove a bargain with or won a strike against this opponent.

The Rest of Us, We're In

Maybe you're an engineer, or clerk in a mining company or community, a mining stockholder, maybe a merchant in a mining region, or a manufacturer selling to mining customers, or the wife of any of these people. You're in this, too, and your voice alone can win this battle if you'll only use it.

Whether you make your living in whole or part from mining, or if you simply want to see your children have enough raw materials on which to build better lives, pick up that mighty pen and let your representation in Washington know that you want a better tax climate for mining.

Every American has both an economic and a security stake in a healthy mining industry, powered by the greatest economic driving force ever devised, free private, competitive enterprise! Men don't go down into holes in the earth because they don't like sunshine. They go there for profit, and your Federal Government's tax policies are strangling both profit and the hope of profit. Do something about this!

You Are Not Alone

The movement for tax incentives for mining investors is being set up on a broad base. The U. S. Bureau of Mines has been at work for several months in an effort to do something for mining within the Administration. Many people in Washington are becoming worried over the way the tax structure discourages venture capital. The National Minerals Advisory Council, set up to help the Interior Department on mining problems and consisting of mineral industry leaders from all over the country, has, after considerable study, made six recommendations for changes in the present tax laws. These are explained on page 57. The Tax Committee of the American Mining Congress has endorsed these recommendations. *Engineering & Mining Journal* is giving half its editor's time for the first six months of 1950 to help organize the drive, in addition to its editorial support. The American Mining Congress is sponsoring the movement. The Mining and Metallurgical Society of America is taking a hand. State and regional mining associations all over the country are putting their shoulders to the wheels. The united support of all mining associations, publications, companies and communities is urged to support this drive.

But it all comes back to you, the individual with a vote. Without you, all the rest of the movement is impotent. Your senators and congressman want to know where you stand, and if they hear from you, they'll take action.

Just Lend a Hand

Will you spend a half hour of your time and nine cents postage to write your members of Congress? If you don't, you may see the mining industry degenerate to the status of a Government ward. Will you get the other members of your organization to do this very little but vitally important thing? Will you ask your wife to read this statement and enlist the support of the organizations to which she belongs? Will you explain to your local business men's groups how and why they should take action. Surely, this is asking very little, and you have so much at stake.

Please remember that it may be very human but will be completely futile if you merely accept this viewpoint but do nothing about it. Action is what counts. Take it!

President Truman's Tax Message Said:

"I know of no loophole in the tax laws so inequitable as the excessive depletion exemptions now enjoyed by the oil and mining interests."

"Originally introduced as a moderate measure to stimulate essential production in the first World War, this special treatment has been extended in later years."

"...the depletion exemption goes on year after year, even though the original investment in the property has been recovered tax-free not once but many times over."

"...the tax bounties distributed under the present law bear only a haphazard relationship to our real need for proper incentives to encourage exploration, development and conservation of our mineral resources."

What You Should Know About

After President Truman's outburst on depletion, we asked Mord Lewis, of Anaconda Copper Mining Co., to tell us how the depletion allowance came about, and why mineral producers are entitled to it. From his replies, we prepared this simple statement of fact.

The Editors

SUPPOSE A FRIEND OF YOURS, who is not in the mining business, were to ask you, "What's all this depletion allowance that the President got so excited about in his tax message? Why do you mining fellows get a break like that, anyway?"

Could you give him a clear and convincing answer? If not, this article is for you, and for him, too. The answers are here, and they're worth some thought.

President Truman's special tax message to Congress on January 23 called the depletion allowance for mines and oil properties a loophole in the tax laws that ought to be plugged. He implied that mining and oil companies had somehow put over a successful tax evasion racket that was unfair to other taxpayers and other industries alike. It is a safe bet that at least 75% of the people who read Truman's statement took it at its face value.

Was It True Or False?	The Facts Are:
Depletion allowances for mineral producers are **NOT** loopholes in the tax laws; they are **NOT** inequitable; they are **NOT** excessive. ➡	**Congress established depletion 37 years ago. Both Congress and the courts have reviewed it repeatedly. No "loophole" could have stood this test.** **Depletion was designed to correct an obvious inequity, not create one.** **Depletion, considered as a whole, falls short of returning the capital investment in the mineral industries.**
Depletion was **NOT** introduced to stimulate metal production for the first World War; it has **NOT** been extended "in later years," except for certain non-metallic minerals. ➡	**Depletion began with the Income Tax Amendment to the Constitution on March 1, 1913. It had nothing to do with the first World War. Its means of application to coal and metal mines has not been changed since 1932.**
Depletion does **NOT** always go on year after year. Under the general rule governing depletion, the allowance ends when cost or fair value is recovered. ➡	**Only under the percentage depletion rule can the allowance go on "year after year." Even then it is in line with past practice under the actual cost or fair value method of calculation. (See text.)**
Depletion does **NOT** aid mineral development haphazardly. It is direct, all-embracing and automatic. ➡	**Depletion helps miners only when ore is developed, mined and sold at a profit. It is therefore a direct incentive to efficient production of those mineral products that are needed most.**

Depletion Allowances

Why shouldn't they? Knowing nothing about mining's special problems, their reaction must have been, "Those oil and mining people certainly get away with murder. How long has this been going on?"

What Is Depletion?

There is nothing new in the depletion allowance. Nor is there anything new in the U. S. Treasury's opposition to it all these years. In 1937 and again in 1942, Henry Morgenthau, Secretary of the Treasury, singled out the depletion allowance as a special privilege. He asked Congress to stop it or at least restrict it. Congress, after long hearings in both years, did neither.

Briefly, the depletion allowance gives a mining company the means to hold a certain portion of its net income free of Federal tax. There are three ways to figure depletion, and we'll discuss them farther along. The simplest way goes like this: A metal mining company can take 15% of its gross income and deduct that amount from its net income before figuring Federal income tax on it. If this 15% of gross income comes to more than 50% of the net, then the company deducts the 50%-of-net rather than the 15%-of-gross.

In other words, a metal mining company gets a special deduction from its net income, for tax purposes, of 15% of its gross income or 50% of its net income, whichever is the smaller.

Why Have Depletion?

Congress set up the depletion allowance back in 1913 because it recognized that oil and mining face a unique problem. No other industry has one like it.

A manufacturer, for example, puts his money, his capital, into plant and equipment. Then he buys raw

materials, makes something, and tries to sell it at a profit. The law recognizes, however, that he has a right to get some of his capital investment back before the tax collector steps in each year. He then uses this right when he deducts from his gross income an allowance for depreciation of plant and equipment. As long as the supply of raw materials holds out, and as long as a demand for his product exists, the manufacturer can stay in business indefinitely.

But a miner, on the other hand, is up against a definite limit, the size of his orebody. He, too, puts capital into plant and equipment, but unlike the manufacturer, he has also to spend money to find and to develop his orebody, his raw material. That is why mines call for such unusually large capital expenditures before a dollar of profit ever rolls in. Then when the miner does get into production, he begins eating up his capital at once, whether he likes it or not.

The miner's capital is his orebody plus his plant. The faster he mines, the faster his capital vanishes. When the orebody is all mined out, he's out of business. Therefore, he simply has to figure that some part at least of the price he gets for his ore is nothing but his capital investment returning to him. If he looked at all of it as operating income, he'd be fooling himself, and perhaps going broke.

In simple justice, therefore, a miner has as much right to recover his investment in his orebody, before taxes, as a manufacturer has to recover his investment in machinery. Depletion is nothing but a different name for a depreciation deduction that applies only to mining. It applies only to the mineral industry because only oil and mining companies must consume their capital as they go.

How Is It Figured?

In the simplest case, let's say the Government and a miner agree that his mineral property has a cost of $100,000. He intends to mine the ore at a rate that will exhaust it in 10 years. If he mines one-tenth of the ore each year and sells it at a profit, he can deduct $10,000 as "cost depletion" from his net income each year before figuring his income tax.

But in practice, of course, it is never that simple. He gets the depletion allowance only when he mines the ore and sells it. Also, if he runs at a loss, he either gets no depletion allowance at all, or else the deduction simply reduces his ultimate profit.

At present, the depletion allowance for mineral property is based on these alternatives:

1. Cost of property.
2. Fair market value as of March 1, 1913.
3. Fair market value at date of discovery.
4. A percentage of annual income.

Each of these has a special application, but a miner is not made to stick with any one of them. In fact, the law now requires that the taxpayer has to deduct the largest amount of depletion that can be calculated under any of these methods that may be open to him.

Federal income tax, and depletion, date from March 1, 1913. That was the first day of the first month after ratification of the Sixteenth Amendment to the Constitution, the income tax amendment. It is an important date for mining men, because around that date has grown the so-called "general rule" for determining the basis for the depletion allowance.

This rule is that depletion shall be measured against either the cost of the property or its fair market value on March 1, 1913, whichever is the greater.

It is easy to see how that came about. All income earned or accrued, and all increase in capital value accrued, *prior* to March 1, 1913, has been free of tax under the first, and all later, tax laws. Thus, a mineral property might have been bought in 1905 for $100,000. By 1912, exploration and development might have brought in orebodies worth $1,000,000. Under the tax law, this increase in capital value was to be free of tax, therefore the depletion deduction had to recognize that fact. That is why the "general rule" for depletion is based on either the cost of the property or the fair market value as of March 1, 1913, whichever is greater.

Let's take a minute to explain the word "basis" as the Bureau of Internal Revenue uses it for mines. In general, basis means the value in money given to property for tax purposes. This money value can be a "fair value" basis only when the property qualifies under the general rules. Otherwise the basis for depletion would be the cost of the mineral property. (We'll get around to discovery depletion and percentage depletion a little farther along.)

The miner's "basis," a fixed sum of money, is reduced each year by the amount of depletion allowance. When they add up to the miner's basis for depletion, he has his money back and his property has a zero tax value. No more depletion, in other words, unless he invests more money to find new ore, or works on a percentage basis.

The basis for cost depletion does include expenditures for exploration and development, but only in the property being depleted. This is done because no depletion at all can be taken until the property is in production. The present law leaves room for considerable difference of opinion on just what constitutes "exploration and development prior to production."

If the miner is entitled to fair market value as the basis for depletion, he can add in only the cost of any later additions to his capital value.

Discovery Depletion

The Internal Revenue Code now recognizes two major exceptions to the general rule that we just discussed. The first one is for mineral deposits discovered after March 1, 1913. It's called the discovery depletion method. The second exception is the percentage depletion method. Under this one, the taxpayer deducts a simple percentage of his net and doesn't bother with fair value or cost calculations.

Discovery depletion dates from the Revenue Act of 1918. It was set up to give fair treatment to anyone who might have discovered a mineral property after March 1, 1913. As the law stood, he would be limited to the cost of property in figuring his depletion basis.

The 1918 Act provided that deposits discovered *by the taxpayer* after March 1, 1913, could be valued on a fair market value basis at the date of discovery. If this fair value materially exceeded the taxpayer's cost of property, he could use the fair value basis instead.

Discovery depletion was used a lot by oil and gas producers in the Twenties, but none may use it today. About the only people who could, or do, are miners of non-metallic minerals that do not now come under percentage depletion. Rock quarries and gravel pits are not "mines" according to court decisions, and don't get depletion. For most mines, the burden of proving that the mineral property was discovered *by the taxpayer only* is just too great. There is always a reference in the literature to nearly any mining district, and the Treasury can cite it as showing discovery by someone else. For that reason, discovery depletion now has little more than historical importance.

Once the fair value of a property has been deter-

mined, whether by cost, fair market value, or discovery value, the calculation of the depletion allowance is easy. Here is an example:

Calculation Easy

A property is estimated to hold a total of 50,000,000 recoverable "units" (i.e., lb. of metal, tons of ore, bbl. of oil). Its fair value is fixed at $1,000,000. Therefore, the fair value divided by the total recoverable units gives $0.02 per unit as the depletion rate.

If the property produces 2,500,000 units during the tax year, the depletion deduction will be $0.02 times that, or $50,000. The total recoverable units would be exhausted in 20 years at that rate. The sum of the depletion allowances would then equal the fair value of $1,000,000, and the allowance would end. If the company found more ore (more recoverable units), for example, at the end of the 11th year, it would simply increase the divisor and decrease the depletion rate. The tax laws don't let you revalue your property just because you find more ore.

Percentage Depletion

The catch, of course, comes in when you and the Bureau of Internal Revenue get together to figure the fair value of your property. There's no problem in figuring cost of property, if that is to be the basis, but if fair value is the greater, you have to use it under the "general rule." Then you get into trouble.

To figure fair value by a "present-value" method of appraisal means that you have to determine some eight factors that at best can be only educated guesses. These are: tonnage of ore, grade of ore, probable recovery, life of mine, cost of production, selling price of ore or metal, capital requirement, and future interest rate. There's not much hope of getting even two engineers to agree on these factors as applied to a given mineral property, let alone a taxpayer and the Bureau.

Arguments arose almost at once when the income tax law went into effect. To settle these in the courts cost both the Government and the taxpayers a lot of time and money. The Bureau had to pass on highly complex property valuations, and the taxpayer had to spend large sums developing the information the Bureau demanded of him.

The upshot was that the industry and the Bureau got together, beginning in the early Twenties, to try to work out a simpler method of figuring depletion. Because there was a flood of depletion applications from oil companies pouring into the Bureau's offices at that time, the oil problem got the first attention.

In the Revenue Act of 1925, Congress gave oil companies the right to figure depletion based on a percentage of the taxpayer's income. He could forget about calculating the fair value of his property. This percentage was carefully worked out to yield about the same rate of depletion as had been granted the oil companies previously under the fair value, cost, or discovery depletion methods.

This way of doing it proved so simple and fair all around that a Congressional Joint Committee on Internal Revenue Taxation took great pains over the next few years to study the extension of percentage depletion to metal mines, coal, and sulphur deposits. The report of this committee resulted in the Revenue Act of 1932, which brought coal, sulphur, and several types of metal mines under percentage depletion.

The Joint Committee satisfied itself that the percentages it assigned to the various mineral products were in line with depletion sustained under the older method. The rates fixed in 1932 have been maintained without change for coal, metal and sulphur. They are:

Coal mines	5%
Metal mines	15%
Sulphur mines or deposits	23%
Oil and gas wells	27½%
Bauxite, fluorspar, flake graphite, vermiculite, beryl, feldspar, mica, talc (including pyrophyllite), lepidolite, spodumene, barite, ball-sagger-china clay, phosphate rock, trona, rock asphalt, bentonite, gilsonite, thenardite, potash	15%

For all of these the amount of percentage depletion deductible is limited to 50% of the net income from the property.

Here's a typical calculation of depletion under the percentage method for a metal mine selling ore concentrates to a custom smelter:

Income from sale of concentrate (Net smelter settlements)		$100,000
Income × 15% depletion rate		15,000
Income, less expenses for:		
Mining	$50,000	
Milling	17,000	
Depreciation	3,000	
General	7,500	
State income and property taxes	2,500	
	$80,000	
Net income from property		20,000
Net income × 50% depletion rate		10,000

In this case, the depletion allowance used would be $10,000 (50% of net income from the property), because that sum is less than 15% of the gross income.

The tax laws governing the basis for depletion and the manner of computation are changing all the time. An enormous amount of litigation has piled up regarding the technical meaning of terms such as "mineral property," "metal mine," "economic interest." Also, the fundamental right of the taxpayer to the depletion deduction has been explored at great length. Use of the percentage method has cleared away a great many of the former difficulties in evaluating properties.

Because the percentage method is applied without regard to the cost or the fair value of the mineral property, the courts have held that the sum of the depletion allowances can exceed the cost or fair value of the property. Strong Treasury opposition is focussed on this point.

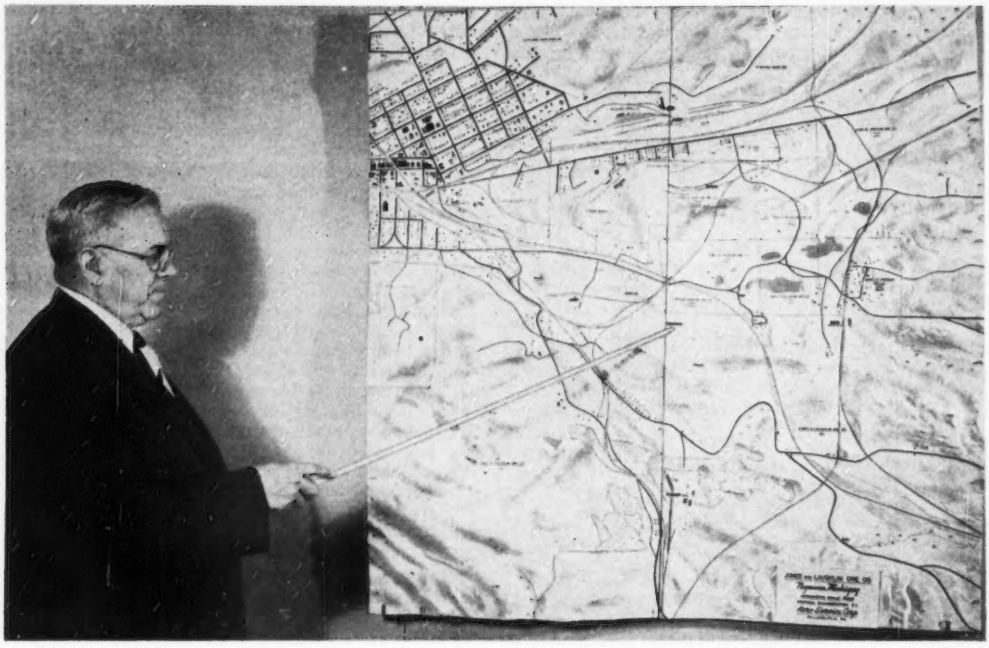
Simple And Fair

Any impartial review of the historical growth of the depletion allowance will emphasize the simplicity of the percentage depletion method. The small miner gets the most benefit from it because he can set up his tax return, using percentage depletion, without a lot of trouble and expense in figuring fair value.

As to its fairness, there is no doubt but that the aggregate of the depletion allowance granted the mining industry as a whole has never equaled the capital expenditure invested in mineral property. Possibly one out of a hundred mining properties ever develops into a substantial producer of profits.

Mining isn't only the routine extraction of ore from the ground. Mining also means spending vast sums for exploration and development of new ore reserves to replace those already mined. Depletion, whether it is figured on a percentage basis or any other basis, performs only the simple justice of helping the investor get that money back. It is a vital part of this huge exploration job, and it must be maintained as a recognized allowance for every mineral producer.

Plastic relief model gives planners a clearer picture of problems than



HENRY S. PETERSON, general superintendent of Jones & Laughlin's Negaunee properties, points out location of central shaft for new orebody. Topographic map and aerial photograph at right are of central portion of same area.

How Plastic Relief Model Aids Mine Development Planning

Model helps top management visualize key problems, saves time in planning road routes, building and stockpile sites, and mine drainage.

A RELIEF MODEL of Jones & Laughlin Steel Corporation's Negaunee, Mich., properties helped to give management a "quicker and better" conception of the problems of opening and developing this area, according to company officials.

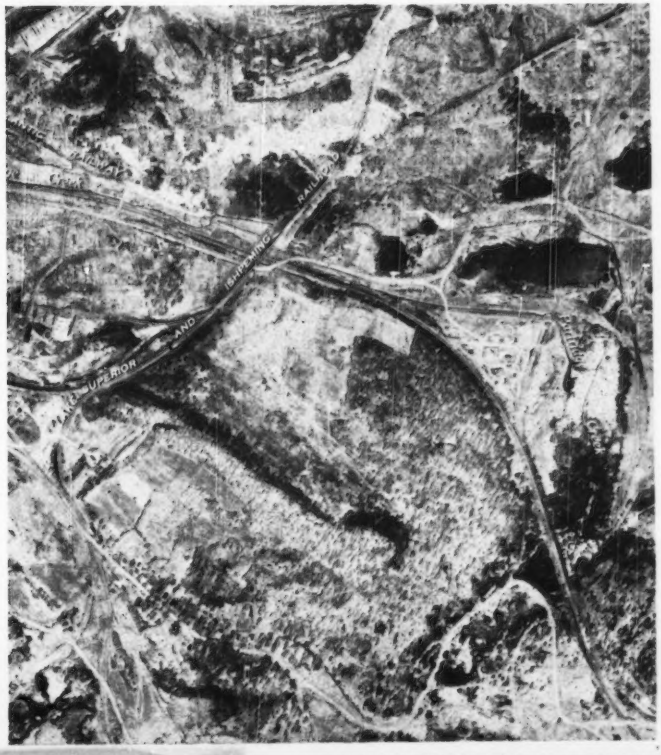
Their intensive exploration program and diamond drilling at Negaunee during the past five years had proven a large hematite orebody. The next step was to present development plans to top management.

Although contour maps were available for the area, J&L's vice president and director of technology, H. W. Graham, directed that a relief model be prepared. A comprehensive tour of 2,500 acres would have taken valuable management time, and some sections would have been inaccessible during their short stay. Moreover, after the tour, it would have been necessary for the officials to study topographic maps of the area if a model were not made. The relief model, it was concluded, would present the problems broadly and concretely in a form immediately understandable to the financial men and others of diversified interests and experience on the managerial staff.

Under the direction of chief geologist, L. P. Barrett, and his assistant, W. M. Fiedler, a 52-in. square relief model was made by Aero Service Corp. of Philadelphia. It was based on aerial topographic maps of the area made by the Philadelphia company in 1944. Horizontal scale of the model is 1 in. = 200 ft.; vertical exaggeration 2 to 1. It covers 2,503 acres in Marquette County, Mich. Cost of the model was about $3,500. In addition to the area's physiography, the model represents local buildings, railroads, and streams, all part of the development problems.

Shortly after the completed model was delivered to Pittsburgh for final inspection and approval, J & L's engineering and geological departments indicated on the model's surface the location of the recently proved Tracy orebody, and three other bodies nearby, and outlined six orebodies in the area which have been exhausted. The relief model was flown to Negaunee a few days before the inspection trip of Admiral Ben Moreell, J & L's presi-

topographic and aerial maps of same area.



dent, and others of the management group.

After a brief tour of the area, the group met in the conference room with the model before them. In miniature it disclosed these problems:

1. Trackage of three railroads cross the orebody to be developed.
2. A sewage line of the City of Negaunee parallels one of these railroads.
3. Forty or fifty privately-owned residences are located on the J&L property near the orebody.
4. Several small streams cross the orebodies.
5. The model also pointed up such questions as the location of mine buildings, stocking grounds, mine drainage, location of access roads and utilities, and related problems.

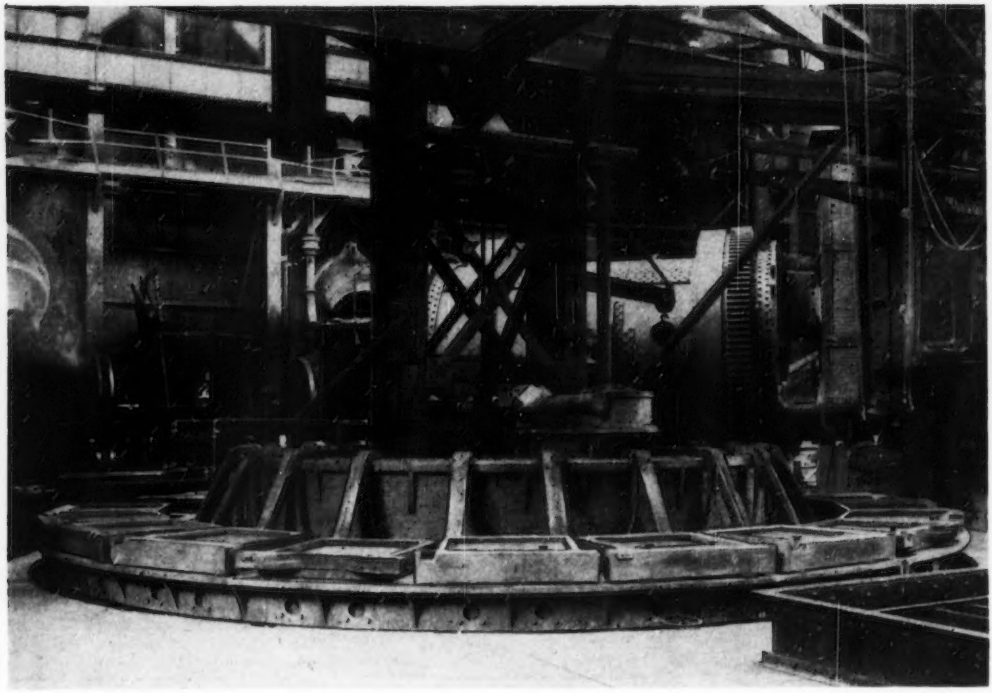
The planning discussion ended with comments from the management staff that the use of the model had given them a much clearer picture than maps.

Since that meeting, the model has been useful in similar presentations to the president and key officials of the Chicago Northwestern Railway, who met with J & L to discuss the problem of relocation of its right-of-way. The model also helped officials of the Duluth, South Shore and Atlantic Railway and the Lake Superior and Ishpeming Railway to delineate the relocation problems more clearly, according to the railway officials.

The model was used also in discussions with Negaunee city officials and later with the engineer they engaged to study relocation of Negaunee's main sanitary and storm sewers which now cross two of the J&L orebodies. After a preliminary study of the area and available city maps, the engineering firm visited J & L to discuss a possible new route. With the model, a better route was selected.

According to Harry S. Peterson, general superintendent for the new development, the relief model will have a continuing use after operations are begun. It will be referred to in moving houses to new locations, laying out service tracks to several shafts, location of mine buildings and other problems. He says, "A preliminary study of the model should not only expedite this work, but also should show a saving in the cost of surveys."

Accurate plastic relief model was based on aerial topographic map (top left) and photograph of area (bottom left).



SMOOTH OPERATION of this electrically-driven casting wheel is important. Anodes must be free of rolled edges and other irregularities for best results. Drive selected for the machine must have proper characteristics.

For Smooth Operation of the

R. B. MOORE
Mining Division
Industrial Engineering Divisions
General Electric Co.
Schenectady, N. Y.

THE EXACTING REQUIREMENTS of copper-anode and wire-bar casting wheel operations demand a type of drive with characteristics selected especially to allow full realization of high-quality, high-tonnage production. We refer particularly to the type of wheel for which the operating cycle consists of rotation through only a few degrees after each pour to bring the next mold into position under the ladle spout,

Operating Features and Advantages Obtainable on Casting Machine with Ward-Leonard Drive and Flywheel-damping-motor Acceleration Control

1. Rates of acceleration and deceleration are individually adjustable between limits, making it possible to set control for best performance. Voltage and speed of machine follow smooth curves, thereby keeping disturbance of liquid metal in molds to minimum.
2. Maximum speed of machine is easily adjustable, making it possible to preset maximum speed at whatever point is selected to give the best performance.
3. Acceleration, deceleration, and stopping of machine are completely automatic following operation of initiating push button by operator. Thus, movement of machine will follow faithfully repeated cycle that has been established for best results, without being subject to varying skills and errors of operating personnel.
4. Drive is reversible, permitting operation in either of two directions.

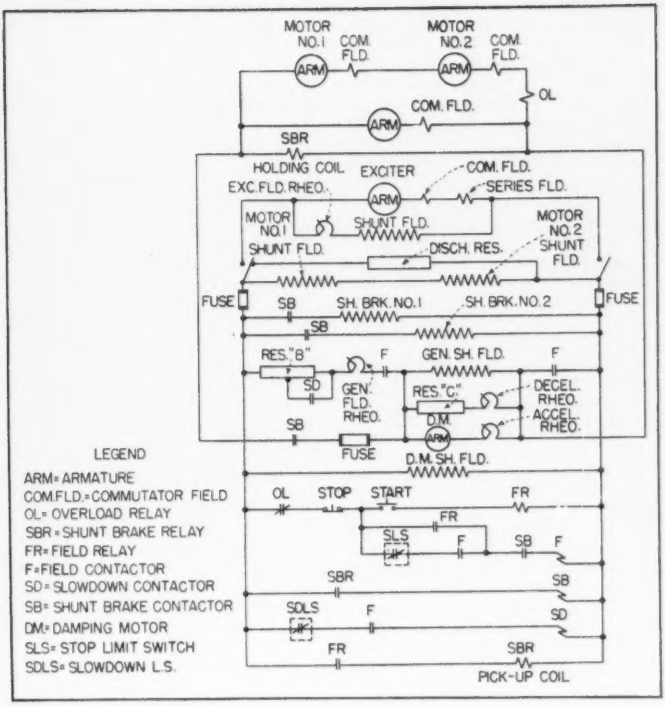


Fig. 1. ELECTRICAL CONNECTIONS for Ward-Leonard casting-machine drive with flywheel-damping-motor acceleration control.

Casting Wheel

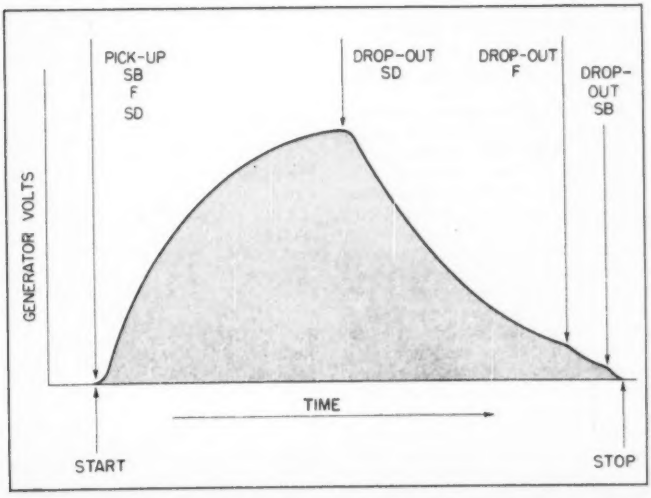


Fig. 2. VOLTAGE-TIME ACCELERATION CHARACTERISTICS obtained with flywheel damping motor are shown. See legend in Fig. 1 for symbols.

at which position the wheel is stopped until the pour is completed.

Even though physically very different from the casting wheel, the straight-line casting conveyor, such as is often used in brass-casting, has certain similar operating requirements with respect to drive equipment, which may be the same basically for both. For simplicity, this discussion will be based predominantly on the casting wheel. The ideas in general, however, apply equally well to the casting conveyor.

Although there is much variation in wheel design, in general a casting wheel consists of a concentric structure supported on roller bearings and rotated in a horizontal plane, with the molds lying flat on a horizontal surface near the periphery, and spaced a few degrees apart at equal angular distances around the wheel. Diameters of 30 to 40 ft. are common for casting wheels.

In the case of casting conveyors, the motion is straight-line, with the molds lying on the conveyor, regularly spaced a few feet apart.

Smooth Operation Important

Copper anodes and wire-bars must be free of rolled edges, ripples, and other irregularities if they are to be most suitable for subsequent refining or working, respectively. The electrolytic refining process, for example, is adversely affected by uneven current distribution caused by whatever irregularities happen to exist in the electrode surfaces.

Since the casting wheel is subjected to intermittent motion, great care must be taken to prevent undue agitation of the liquid or partially crystallized copper in the newly-filled molds. The drive equipment must be capable of giving soft and smooth starting, acceleration, deceleration, and stopping, without sudden torque pulsations that might disturb the surface of the fluid copper. Added to this is the necessity for positive speed and position control to assure that the molds will be stopped consistently beneath the pouring spout despite variations in the wheel friction-load.

Electric drive of the Ward-Leonard type with a unique automatic acceleration and deceleration control scheme has proved very successful in meeting these exacting requirements on several installations in the United States. This control scheme was borrowed from elevator-control practice after years

of practical demonstration of its suitability on applications demanding smooth acceleration and deceleration.

Acceleration Requirements

Among the factors that influence the quality of the castings and the rate at which they can be produced are rate of acceleration, rate of change of acceleration, and mechanical condition of the casting machine. Not all undesirable qualities found in castings can be attributed to the drive equipment or motion of the casting machine. For example, rolled edges would probably be found to a certain degree on anodes even though the wheel was not moved, resulting from the adherence of some copper to the relatively cool mold-sides, where it washed up as the pour was being made. However, matters having to do with acceleration are closely related to the drive equipment and must be factored into the selection of suitable equipment.

When the wheel is started from rest and moved to the next pouring position, it experiences acceleration, then deceleration. For simplicity, we shall refer to both as acceleration, since deceleration is merely negative acceleration. Although the surface of the liquid copper in the mold is horizontal when acceleration is zero, the plane of the surface becomes inclined to the horizontal when the wheel is accelerated. This causes the level of the copper to rise on one side and to decline on the other side, the direction of the action being dependent on the direction of acceleration. The degree of shift of the molten-copper surface plane is determined by the magnitude of the acceleration; the greater the rate, the higher the copper level rises on one side of the mold, increasing the tendency toward rolled-edges on the casting. Therefore, it is desirable to limit the rates of acceleration on casting wheels to values that will keep the inclination of the plane of the liquid copper surface within acceptable limits to reduce the problem of rolled edges.

The rate of change of acceleration is also a factor influencing the the quality of the castings. As already explained, there is a certain angle of surface-plane inclination corresponding to each rate of acceleration; and the rate of change of acceleration determines the suddenness with which the inclination of the surface plane changes from one angle to another. Thus, this rate of change is a measure of the "roughness" of a given wheel, and a very high rate may cause excessive agitation of the copper, resulting in objectionable ripples or poor crystalline structure in the castings. Inasmuch as a high rate of change of acceleration has the effect of an "impact" blow, it is reasoned that even partially cooled castings may be shaken up at a critical stage of crystallization, resulting in reduced quality of product. A gradual rate of change of acceleration therefore gives best results. This is especially true at the end of a period of acceleration when the surface plane is attempting to regain a perfectly horizontal position, if several oscillations or undulations of the fluid mass are to be avoided.

Mechanical Condition

The mechanical condition of the casting machine, as well as the drive equipment, has a bearing on quality of production. For example, mechanical backlash in the gears or roughness in the supporting bearings could cause sufficient vibrations or pulsation to introduce ripples into the castings. In addition, high static friction may cause a high breakaway-torque requirement, which decreases rapidly as the wheel begins to turn, resulting in a sudden, momentary acceleration due to the temporarily available excess driving torque. Although a drive equipment with good speed regulation at very low speeds will minimize this effect, the best solution is to eliminate the cause by keeping the wheel in good mechanical condition with low friction.

Practical Acceleration Rates

With respect to making installation adjustments on a casting machine, it is desirable to set the acceleration rate as low as possible and still meet the production schedule. On any given casting operation in which a certain time-cycle must be observed in moving from one pouring position to the next to meet a definite production schedule, there is a minimum average rate of acceleration that will satisfy the requirements. With this minimum rate in use, the wheel will come up to maximum speed, and then begin its deceleration almost immediately. At any lower rate of acceleration, the required distance could not be covered in the required time. There are any number of greater rates of acceleration that would satisfy the requirements of the distance-time cycle, but at some sacrifice in smoothness of operation. It can be seen that the minimum allowable average acceleration defines the optimum degree of smoothness that can be attained on any given casting machine operated economically to meet a production schedule. There is, therefore, a definite limitation in what the driving equipment can be expected to do in the way of improving the smoothness of operation.

Sometimes it is possible to increase production without lowering quality by actually increasing the time consumed in moving the wheel between pouring positions. This seeming paradox may be possible because a lower rate of acceleration may improve the smoothness to such an extent that the customary "waiting period" after the pour can be drastically reduced, thereby contributing to a shorter over-all cycle-time. This technique was recently used so successfully in a Southwestern smelter on an anode-casting wheel that the production per shift was greatly increased.

The Electric Drive

Casting machines as discussed herein usually require no more than 10 to 15 hp. On large wheels it is customary to use two equally rated motors driving through reduction gearing at diametrically opposite points on a large concentric ring gear.

The Ward-Leonard drive to be described consists of two dc motors with floor-mounted holding brakes, an ac and dc motor-generator set with direct-connected exciter, a motor-generator set starter, an adjustable rotating-type limit switch driven through reduction gearing by the casting machine, a "forward-reverse-stop" push button, a generator field rheostat for pre-setting maximum machine speed, and a dc control cabinet containing the contactors, relays, and acceleration control devices. The push-button station and the rheostat are mounted in the operator's booth; the motor-generator set, its starter, and the dc control cabinet are usually placed in a clear, remotely-located control room. Dusty conditions near the casting machine make it advisable for the dc motors, brake solenoids, and limit switches to be of the enclosed-type. All of the other electric apparatus, being in cleaner locations, usually require no special precautions.

The two dc motors, with armatures connected in series, are sup-

plied with adjustable-voltage dc power from the dc generator. As there is no necessity for opening this "loop" circuit, these three machines are permanently connected without any power-switching or disconnecting devices. The motor shunt fields, also in series, receive constant excitation from the dc exciter. The series connection assures proper load division between the two motors, as they are duplicate machines carrying the same armature and field currents. An instantaneous overcurrent relay connected in the armature circuit will shut down the drive in case of excessive load or jamming, thereby protecting the casting machine and electric drive equipment against excessive torque and current.

The exacting acceleration control is obtained by means of a flywheel damping motor, mounted inside the dc control cabinet. This sturdy and reliable device is nothing more than a fractional-horsepower shunt-wound dc motor with a small flywheel on its drive shaft. Electrically, the damping-motor armature is connected in parallel with the shunt field of the Ward-Leonard generator, while fixed excitation for the damping motor is obtained from the dc exciter. Floating across the generator field and acting as an energy-storage device, the flywheel damping motor gives acceleration characteristics that are beautifully adapted to casting-wheel requirements.

The Method of Operation

Fig. 1 illustrates the electrical connections of the dc control, shown as non-reversing for simplification. The sequence of control-device operation can be traced on the connection diagram. Functionally, the operation of a casting wheel is as follows:

After the motor-generator set has been started (ac control not shown), the wheel is ready for operation. To move the wheel so as to bring the next mold into pouring position, the operator has only to push the "start" button. As controlled by the flywheel damping motor, the generator voltage builds up smoothly to the maximum value as preset on the generator field rheostat, automatically bringing the casting wheel to maximum speed. When the wheel has moved a certain distance, a contact in the rotating limit switch opens, causing the casting wheel to decelerate smoothly, again under control of the flywheel damping motor, to a preset slow speed. About the time this slow speed is reached, another contact in the rotating limit switch opens, allowing the generator voltage to complete its decay, still controlled by the flywheel damping motor. Shortly after this final limit switch contact opens, the generator voltage has reached a very low value, at which the brakes set and the generator "suicide" connection is made, and the casting wheel comes to a smooth stop. After the pour has been made, the wheel is ready to move to the next position for another pour.

Acceleration Control

The purpose of the flywheel damping motor is to limit the rate of change of generator voltage during acceleration of the casting machine. Since motor speed in a Ward-Leonard system is essentially proportional to voltage, a smooth voltage control results in smooth speed control on a casting machine in good mechanical condition. Voltage on a generator is nearly proportional to its shunt field current, until saturation limits the flux; therefore, a good method of limiting the rate of change of generator field current is also an effective means of limiting rate of change of armature voltage. This is neatly accomplished by the flywheel damping motor, as will be explained.

Although a certain amount of time is inherently required for current to build up or decline in an inductive generator field, the time constant[1] of fields on generators of the size used on casting machines is short, ordinarily about half a second. These natural time constants are too short for casting-machine acceleration, and the flywheel damping motor is used to extend the effective time constant to several times its natural value. The time constant, incidentally, is a measure of the rate at which energy can be added to or taken from an inductive field. Note that electrical energy is stored in the current-carrying generator field, and kinetic energy is stored in the rotating flywheel damping motor.

In Fig. 1, when the casting machine is started, contactors F and SD are closed, applying voltage to the generator shunt field and the damping motor. At first, most of the current is shunted around the generator field and flows through the damping motor, which is standing still and has no counter-emf. This causes a large drop of voltage across the generator field rheostat and part of Resistor "B," limiting the initial voltage on the generator shunt field to a low value. However, as the damping motor builds up speed and counter-emf, its current drops off gradually, allowing the generator shunt field voltage and current to build up smoothly. Final steady-state conditions are reached when the damping motor is running light at a speed determined by the values of the circuit components. By making the stored energy of the flywheel damping motor several times that of the generator shunt field at a given voltage, the effective time-constant can be made long enough to satisfy the acceleration requirements of casting machine operation. The size of the flywheel and the "acceleration rheostat" provide means of presetting the acceleration characteristics for bringing the casting machine up to maximum speed.

Upon retardation of the casting machine, when contactor SD, and later contactor F, drop out, the flywheel damping motor in slowing down gives up some of its stored energy to the generator shunt field, thereby greatly extending the deceleration time beyond the natural time. Adjustment of the slowdown characteristic is obtained from the "deceleration rheostat," the setting of which determines how much of the energy given up by the flywheel damping motor is passed to the generator field.

A "Soft" Start

The ideal characteristics given by the flywheel damping motor acceleration control are graphically illustrated in Fig. 2. Note the "soft" start as voltage begins to build up and the smooth increase in rate of acceleration to virtually zero as steady state speed is approached, following a change in speed. Such a characteristic makes possible the restoration of the plane of the surface of the liquid metal in the mold to a horizontal position at the end of an acceleration without the "overshoot" or undulations described earlier. In addition, the maximum acceleration, which occurs shortly after a speed change is initiated, can be adjusted easily to the value permitted for best performance of the equipment. The limit switch contacts may be adjusted independently to initiate "slowdown" and "stop" at any required positions.

[1]Time constant of a field may be defined as time required for the field current to make approximately 63.2% of a total change due to a change in voltage.

Where Do They Get Their Iron Ore? *Principal Sources Only and Excluding Ores Purchased Abroad*	U.S. Steel Corp. 31.3 Million Tons Ingot Steel Capacity	Bethlehem Steel Corp. 14.2 Million Tons Ingot Steel Capacity	Republic Steel Corp. 8.6 Million Tons Ingot Steel Capacity	Jones & Laughlin Steel Corp. 4.8 Million Tons Ingot Steel Capacity
From Company-Owned Mines...				
Mesabi AND LAKE SUPERIOR AREA	Has largest reserves in Lake Superior area	Produces for self, also buys heavily	Has holdings on Mesabi — Gogebic	On Mesabi, will start on Gogebic
Other U.S.A.	ALABAMA UTAH	PENNSYLVANIA	ALABAMA ADIRONDACKS	ADIRONDACKS
Foreign		CHILE, CUBA		
From Ore Companies...				
Pickands, Mather & Co. Principally manages mines for Bethlehem and Youngstown		✓	*Pickands, Mather manages Erie Mining Co. (see bottom line below)*	
Cleveland-Cliffs Iron Co. Biggest operator on Marquette range Also operates on Mesabi		✓	✓	✓
M. A. Hanna Co. Second only to U.S. Steel in Lake Superior area holdings	*M. A. Hanna, a National Steel affiliate, is the prime mover and minority owner of the Hollinger-Hanna ore development in Labrador*			
Oliver Iron Mining Co. U.S. Steel subsidiary, the No. 1 operator on Mesabi range	✓	✓	✓	
Oglebay, Norton & Co. A management company, directs large operations on Gogebic		✓	*Oglebay, Norton is management company for Reserve Mining Co., joint venture in processing of low-grade taconite ore.*	
And in the future...				
Foreign Ore	VENEZUELA	VENEZUELA, CUBA CHILE, MEXICO	LIBERIA LABRADOR	
Low-grade Taconite	Independent operations	Erie Mining,		

Today's Iron Ore Sources

IN THE ABOVE CHART are shown the principal sources from which the ten leading steel companies of the United States obtain their raw material iron ore. Prospective future sources are also indicated. The question of ore supply has once again been thrust into the limelight by the news that the United States Steel Corp. has made an important discovery of ore at Cerro Bolivar in northern Venezuela (Feb. *E&MJ*, p. 172), apparently outranking even the El Pao deposits in the same part of the world and from which the Bethlehem Steel Co. is shortly to be in production. Big tonnages can be made available in both areas by open-cut mining.

With Venezuela, the major iron ore sources for next 50 years now number three. First and foremost is the Lake Superior region, in particular the Mesabi range. Despite the huge tonnage that Minnesota's giant range has yielded, since shipment began in the early '90's, enough for several decades still remains of the direct shipping high-grade ore that is left and the leaner ores that can be beneficiated by present methods. Equal to, if not exceeding the total tonnage of ore shipped from the Mesabi mines, is the tonnage of taconite on the Mesabi—the lean iron-bearing material from which the range's commercial orebodies were derived by natural concentration. Work in re-

National Steel Corp. 4.2 Million Tons Ingot Steel Capacity	Youngstown Sheet & Tube Co. 4.1 Million Tons Ingot Steel Capacity	Armco Steel Corp. 3.6 Million Tons Ingot Steel Capacity	Inland Steel Co. 3.4 Million Tons Ingot Steel Capacity	Sharon Steel Corp. 1.7 Million Tons Ingot Steel Capacity	Wheeling Steel Corp. 1.5 Million Tons Ingot Steel Capacity
Only big source is M. A. Hanna	Lake Superior mines	Relatively small Mesabi holdings	Minnesota and Michigan ores	Only big source is Oliver Mining	Mesabi holdings
	✓	*Cleveland-Cliffs is part-owner (with Armco and Wheeling Steel) in Reserve Mining Co. which will process low-grade taconite ore (below).*			
✓		✓	✓	✓	✓
✓	✓	✓	✓	✓	✓
		✓			✓
LABRADOR	LABRADOR	LABRADOR	ONTARIO		LABRADOR
	Erie Mining, 45% owner	Reserve Mining, one-third owner			Reserve Mining, one-third owner

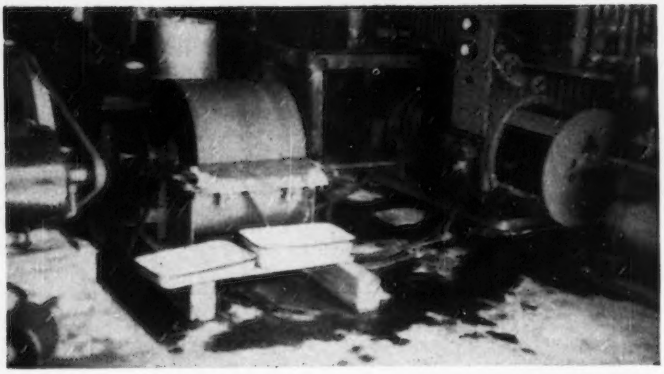
and Our Future Supply

search laboratories and pilot plants to date has demonstrated that the iron contained, an enormous quantity in the aggregate, can be made available by surface mining to the steel industry as a major source of iron. In taconite the United States has a reserve of ore adequate to supply the furnaces of the Central Steel Making District indefinitely.

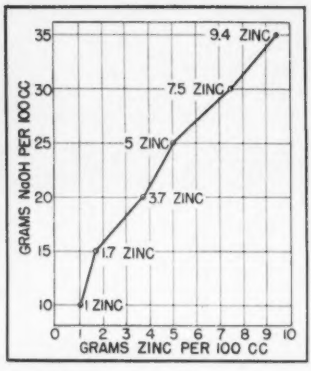
During the period in which the problem of taconite beneficiation has been under study, a new source of iron ore rivaling the Mesabi has been found in northern Quebec and adjacent Labrador. To date, between 300 and 400 million tons of high-grade ore minable on surface has been proved by exploration drilling to exist. The financing of production and of transport to market has been arranged. Within a decade this ore will be finding its way to lower Lake Ports and Eastern seaboard points.

Iron ores purchased outside the United States for consumption here are not indicated in the chart. Last year they amounted to almost 5 million tons, coming chiefly from Canada, Sweden, Algeria and Brazil.

For facts and figures relating to plans for developing Minnesota taconite as a source of iron and exploiting the new resources of Labrador and Quebec, as well as of Venezuela, the reader is referred to pages 84 to 91 of *E&MJ's* July issue, "Mining Looks to the Future."



ROTATING DRUM gives about three sq. ft. of cathode area and 1,000 amps. pass through the bearings. Zinc dust is scraped from drum by a heavy blade.



STRENGTH of caustic solution required to precipitate zinc in the ore.

Low-Cost Production of Zinc Dust from Oxidized Ores

Seven Steps in the Proposed Process for Producing Zinc Dust from Oxidized Ores

1. Calcination of ore for one hour at 250-400 deg. C.
2. Solution of zinc in strong caustic solution.
3. Separation by decanting or filtration of the solution.
4. Removal of lead by precipitation.
5. Precipitation of zinc sponge.
6. Washing and drying the zinc dust.
7. Regeneration of the spent solution.

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PRODUCTION OF ZINC dust from oxidized ores at low installation and production costs may be at hand. Recent work by the authors has indicated the path. Only confirmatory tests, omitted because of the untimely withdrawal of the project's financial backing, are needed.

Economical treatment of oxidized zinc ores at localities where available tonnage does not warrant construction of large plants, has long been a problem for metallurgists. Furthermore, because oxidized ores have not proved amenable to present concentration methods, and because freight rates are high, shipment to reduction plants offers no solution. This process described by the authors may furnish an answer.

Main process steps as shown by the laboratory work included calcination, solution of the zinc in strong caustic solution, settling or filtration, removal of lead, precipitation of zinc sponge electrolytically, washing and drying the dust, and regeneration of the spent solution. The chief problems were: (1) The effect of cyclic use of solution, (2) power consumption, (3) caustic consumption, (4) purification of solution, and (5) manufacture of sufficient quantities of typical dust for test purposes. One of the advantages that caustic leaching has over other processes is the fact that iron tanks and piping can be used in place of costly acid-proof equipment.

It was determined that a better extraction with less carbonate fouling of solution could be attained if the ore was given a one-hour calcination at 350 to 400 deg. C. This temperature was sufficient to decompose the zinc carbonates without reaching the temperature of decomposition of the dolomitic gangue. Calcination was done in a muffle furnace at a very dull red heat and its completion could be determined when decrepitation ceased and the charge became quiescent. One-hour treatment was sufficient, and samples taken after the charge had been brought up to temperature showed that very little time was necessary. Preliminary crushing of the material to be treated to ½ in. was found to be satisfactory, and in practice even coarser crushing might be advantageous, especially if calcining is to be done in a rotary furnace where losses by dusting may occur.

Dissolution

In addition to the caustic soda necessary to form sodium zincate, it is imperative to have an excess of caustic to keep the zinc in solution by preventing hydrolysis. The curve above shows the strength of caustic solution necessary for solution of the zinc content of samples of ore from the Goodsprings district which contain some lead. It is possible to prepare solutions of much higher zinc content but the values given were found by treating an excess of ore with solutions of the strength specified. The higher the caustic, the higher the possible zinc content of the solutions and the less solution to be handled and electrolyzed but the more soluble the precipitated dust

after deposition. A higher content of zinc remains in the barren solution after electrolysis with economic current efficiency. Smaller tests were made in liter beakers heated on an electric hot plate and agitated mechanically. The larger runs were made in a 5-gal. heavy iron agitator with a gas burner for heating. The cone-bottomed tank delivered its contents through an all-iron cock to a Denver pressure filter or through a decanter, if decantation was called for in the proposed flowsheet. The calcined ore was ground to 10 mesh, and at times to 40 mesh. Solution of zinc values was satisfactory at 10 mesh, and this coarse grind could be used if batch agitation and special filtration were used. A 40-mesh grind would be necessary if thickeners with decantation and final filtration on drum filters was the desired flowsheet. The caustic strength used varied from 15 to 35%. While the lower strength solution was unable to carry such a high content of zinc, it settled readily. The high-strength caustic solution had a much higher zinc content but was difficult to settle. Best strength of caustic was found to be 25%. This solution could be settled and the thickened pulp diluted for washing to a strength that would not destroy treated filter cloth (Thoratex). Asbestos cloth was required for stronger solutions. The temperatures used, about 80 deg. C., obviated the use of plastic fabrics.

Tests Were Made

A number of tests were made using various conditions, the best of which was (1) agitation with strong caustic solution containing some zinc; (2) decantation to electrolysis; (3) treatment of pulp with barren solution from cell. The second solution decanted from the pulp became the first solution for use on a succeeding batch. Results of a series of runs are shown in Table 2. Recovery at times was more than 95%, and with careful work could be kept above 90%. It was found important to keep the caustic solution up to strength and make up for losses. All wash solutions were boiled with lime and used as washes until they became progressively stronger. There was considerable evaporation during electrolysis due to heating resulting from the high current density. It is thought that the plant might be operated with no extra evaporation other than that due to evaporative cooling of the solutions. Consumption of caustic soda varied from 0.2 to 0.75 lb. per pound of zinc. Additional research will be necessary to determine best conditions for lower caustic consumption.

Removal of Lead

Most of the work described was done on ore samples containing only small amounts of lead, and the magnitude of the problem of recovery of the zinc was such that the recovery of lead was not recorded. The lead content of the ore is found in the form of carbonate, sulphate, or more rarely vanadate, molybdate, arsenate, and related minerals. The action of caustic solution on the lead minerals was not studied, but carbonate is broken down to oxide in the calcination, and the oxide readily soluble forming sodium plumbate. Sulphate is probably soluble, forming sodium sulphate, which, if present in quantity, would foul solutions. Ore samples used contained little or no vanadium, but stress was laid on good ventilation to prevent any poisonous effect from any arsine evolved during electrolysis.

Copper is slightly soluble in strong caustic but only in amounts sufficient to give a blue solution similar to the copper ammonium complex. It was necessary to remove the lead from the solution before electrolysis in order to obtain a purer zinc dust. The hot solution from the treatment was agitated with portions of zinc dust until a sample of solution showed no qualitative test for lead. The sample was acidified with acetic acid, and the addition of chromate gave a precipitate of yellow lead chromate if only traces of lead were present. Lead content, together with traces of copper, was precipitated as a sponge which was filtered on a vacuum filter. Little work was done on the recovery of lead from the sponge. If not marketed directly, the sponge can be melted, although oxidation takes place even more readily than with zinc. Precipitation of the lead by addition of zinc dust or sponge was the simplest procedure, though it may be possible to precipitate the lead electrolytically by use of a lower voltage. If the zinc dust is to be used in precipitation of precious metals from cyanide solutions, some of the lead could be co-precipitated with the zinc and give a superior product due to action of lead forming an electrolytic couple.

The main impurities encountered were silicate and carbonate, and no major difficulties arose during test runs in which the solutions were used cyclically up to 12 times. In these tests ore batches of 10 lb. each were used. With smaller amounts the losses, mechanical and others, are greater percentage-wise and obscure effects of reuse of solution. The increase in carbonate did cause crystallization of sodium carbonate in the process. In practice, this carbonate would be lost in the tailings, or accumulate in the solutions unless removed by methods on which the authors were working when research was temporarily suspended. The silicate could be precipitated by addition of lime, but the carbonate would not precipitate from strong solutions, and there was trouble in the carbonate precipitation from weaker wash solutions.

Electrolysis

Original experimental work was done with beakers up to liter size and various cathodes and iron cathodes. Electrode spacing, current efficiency, voltage, and a general idea of the qualities of the dust were determined by these tests. The source of electric current was a number of storage batteries connected to give 4 volts. In addition to the stationary cathode cells, there was used a rotating disc cathode, 7 in. in diameter, to make continuous tests. The cathode was partly immersed in a narrow trough-like cell of iron plate which acted as an anode. This cell was the minimum size that would give the required clearance, and the current was passed through the bearings of the copper shaft in the center of the cathode disc. The flow of solution through the cell was controlled so that after passing through the cell about six times the zinc content had been depleted to less than 1% zinc. This would correspond to using six cells in series in a larger plant.

Voltage varied between 3.5 to 4.0, and the analysis of the solutions for zinc gave the electrical efficiencies which decreased with decrease of the zinc content. Total zinc recovered as dust was also determined. Current density used amounted to as much as 300 amp. per sq. ft. This figure appears quite high, but the decreased cost of the cells and the greater capacity would counterbalance somewhat the increased power cost. The voltage naturally increased with increased current density, but the advantage of small cells and the increased evaporation due to heat-

Alternative Methods of Treating Oxidized Zinc Ores

WETHERILL PROCESS uses a grate consisting of a series of cast-iron plates, perforated with as many as 100 conical holes per sq. ft. A bed of ore and coal is burned with an undergrate blast. The Eastern Wetherill consists of four or more hearths built together with a common back wall and common side walls. Combustion products from each hearth are led out through an opening in the arch. The Western Wetherill comprises a series of hearths covered by a common arch and separated by low side walls. Combustion products are conveyed away from the end of the block.

WAELZ PROCESS uses a rotary kiln from 40 to 160 ft. in length, into which is charged a mixture of ore and coke.

SLAG FUMING furnace might be used, with a series of double inlet tuyeres on each side through which pulverized coal is fed against the internal pressure of the furnace.

According to the authors, high installation costs involved in these methods together with the fact that the final product is often not of finished grade do not make local installations attractive.

Considerable work has also been done on ammonia leaching and chloridizing, but without signal success.

ing effect would have to be considered in the economic design of the plant. Our experiments also show that the decrease of current density tends to give more plate zinc, which we wanted to avoid. The voltage varied from a little more than 3 v. up to 4 v., depending somewhat on the temperature of the solutions, and the average power consumption was slightly less than 2 kwh. per lb. of zinc dust.

Larger Cell Developed

The next continuous cell was of 400-amp. capacity, 16-in. diameter disc, and difficulties not apparent in the smaller cell were found. Use of heavier current caused a certain amount of foaming. The foam had to be destroyed either with oil or by ignition of the hydrogen bubbles. One of the main difficulties was the tendency to deposit more solid zinc, and some plate was deposited near the center of the disc where the current density was lower due to the foam. Building up of solid zinc interfered with the operation of the scrapers. Experiments were made with various metal cathodes. The most easily dried coarser dust resulted when using zinc or galvanized cathodes. For larger tests with stationary cathodes, a series of three plates with switch blades which engaged regular switch contacts were used. Guides accurately positioned the cathodes between iron-plate anodes. The series of three cathodes, 7 in. wide by 7 in. below the solution level, could be operated with currents as 500 amp., and each of the cathodes could be rapidly removed in turn and replaced with a clean unit whenever the correct amount of deposit had been acquired. Holes in the anodes near the solution level provided circulation of the electrolyte. A number of plate cathodes made of magnesium, aluminum, galvanized iron, and stainless steel were used. The plates were fitted with handles to permit quick interchange without undue effect on the operation. The deposit could be scraped from the plates and rapid runs could be made without taking the time to provide and change cylinders or discs for the continuous cells.

Final apparatus used for the largest test runs was a rotating galvanized drum cathode 24 in. in diameter and 18 in. long. When immersed in solution, the drum gave about 3 sq.ft. of cathode area, and 1,000 amp. passed through the bearings. The deposit was scraped from the drum by a heavy blade, removing all but the most solid zinc plate. It was thought that it might be necessary in plant operation to continually dress the plate surface with a sharp tool, thereby machining off the solid deposits as fast as deposited. Drum speed was one revolution in two minutes, and power requirement was low. The drum had considerable advantage over the disc-type cell.

Magnesium Cathodes

Magnesium cathodes gave a more finely divided zinc dust showing little tendency to adhere to the cathode plate. In fact, some sponge was detached and floated in the electrolyte and had to be filtered off on a steel screen to prevent resolution. The sponge also had a tendency to be pyrophoric, and at times began to glow and oxidize while being scraped from the plate. Additional difficulties will be discussed in the paragraph covering drying. Stainless steel gave a deposit which showed a slight tendency to adhere especially in the area above the solution level where the foam caused a lower current density. Cathodes of zinc or galvanized iron gave a more crystalline greyish sponge which did not carry or absorb so much zincate solution. There was some build-up of a solid deposit removable by a heavy scraper. Under this granular deposit there sometimes was a zinc plate which possibly would have to be removed by a machine tool to prevent build-up in continuous operation.

Nickel Anodes

Information Circular No. 7466 entitled "Electrolytic Preparation of Zinc Dust," by Walter Eckardt, translated by O. C. Ralston, released after the authors had completed most of their work, describes methods used in Germany for the manufacture of zinc dust by electrolysis of sodium zincate prepared from oxide. Our method differed from that used in Germany in the fact that in the German process the sponge was deposited on magnesium cathode, with the deposit being shaken off and settling to the bottom of a rubber-lined trough. Nickel anodes were used, and the rubber lining was necessary since iron dissolved rapidly when in contact with zinc sponge. If we had trouble from this action it was slight because little or no sponge contacted the iron. The dust we made contained small amounts of iron, together with a small amount of manganese. Toward the end of the electrolysis some solutions became colored by the typical purple color of permanganate, and possi-

bly some manganese dioxide precipitated on the anode, which, on becoming detached, contaminated the dust. None of the ores tested contained any appreciable amount of manganese, and it is not known what the action would be on treatment of ores of higher manganese content. Analysis of the dust is as follows: Zinc, 98.76%; cobalt, 0.18%; manganese, 0.6%; and no iron, aluminum, lead or nickel. Zinc content was found to be lower when oxidation took place during filtering and drying.

Washing Electrolytic Sponge

The sponge as scraped from the electrode contains more than 50% adhering caustic zincate solution, and resolution of the zinc starts immediately, especially when a magnesium cathode was used. Some of the solution can be pressed from the sponge, but only a few experiments were made along the lines of expressing the liquid. Care must be taken that too much dilution is not allowed at start of the washing since hydrolysis of the zincate will cause difficulty. The regular procedure was to filter on an asbestos fabric to remove most of the solution. A small wash of weak caustic solution was then used, followed by hot water until all caustic was removed. A preliminary dilution and decantation, followed by filtration on fabric filter, was sometimes used. Best results were obtained with treated cotton "Thoratex." Air was passed through the filter cake to remove maximum amount of moisture, but overheating would take place unless considerable care was taken. As soon as any overheating was noted, the cake was immediately placed in the vacuum drier.

Drying

According to the paper mentioned before and covering German practice, much of their product was use as sludge and was not dried before use. Zinc dust, especially that made electrolytically, is very reactive and will react with hot water, and has a very low temperature ignition point. The reactivity of the dust varies with the fineness, and we have found that the use of magnesium cathodes gives a dust more difficult to dry than that deposited on zinc cathodes. The product from the magnesium plate may be of better quality for some uses, but owing to the more rapid oxidation during filtration and drying, the resulting dry dust is generally of lower grade. Drying of small batches of dust can easily be carried out by rapid heating in an open iron pan. Rapid stirring to prevent local overheating is necessary because a small portion of the overheated material will ignite the remainder, and the entire mass will oxidize unless considerable care is exercised. Slow drying gives poor results due to the reaction of the zinc with the steam, while with faster drying there is a possibility of overheating, causing ignition. When drying larger batches, up to 1 lb. or more, it was found that a stirred vacuum drier similar to a miniature "Bufflovac Crystallizer" gave the best results. The vacuum prevented overheating of the material and minimized the reaction with steam. As soon as the material was nearly dry and the locally dried material became heated to a temperature at which ignition would take place in air, oxidation was at a minimum due to lack of oxygen in the evacuated drier. When the batch was dry, the drier was cooled before air was admitted.

Drying Equipment

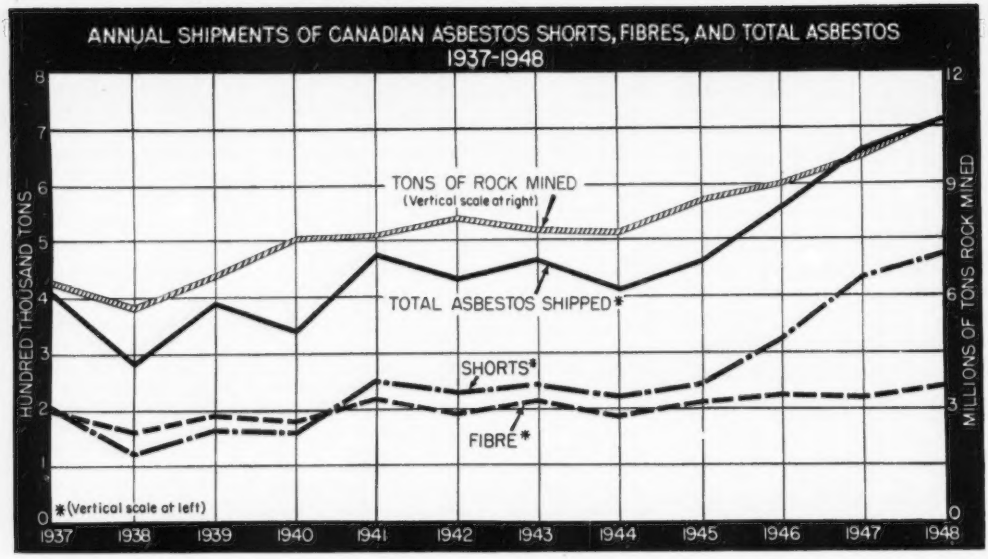
The drier used was a 4-qt. pressure cooker fitted with a modified gasket which would hold under vacuum. A motor-driven stirrer of fairly heavy construction was necessary because the wet cake fed to the drier was quite stiff, and considerable resistance was encountered up to the time the product broke down into smaller lumps. When drying was partially complete, a free-flowing pool of dust covered the floor of the drier, and pieces of drying cake in contact with this dust gave off steam, causing some loss of dust through the vapor outlet. This dust was recovered in a small cyclone collector through which the evacuated vapor was passed. Using a 25-in. vacuum, the volume of vapor was considerable. The removable top of the drier carried a vacuum gage, thermometer, and an interior electric light in addition to the motor and reduction gear assembly mentioned previously. A small glass window made possible inspection of the interior during operation. Heating was by ordinary electric hot plate, which could be removed and replaced by a pan of cold water for cooling the charge at the end of a run. The possibility of using rapid spray-drying was discarded due to danger of explosion of the dust-air mixture.

In addition to the chemical analysis of the dust, the only other test made was that described by W. J. Sharwood (Chem. & Met. Soc. South Africa, Feb., 1912) for determining the precipitating efficiency for use as precipitant of cyanide solutions. We were often able to make a product which had an efficiency of 75%, much higher than that of most dusts on the market.

Uses

In addition to the use as precipitant of precious metals from cyanide solutions, there is a considerable amount of zinc dust used in paint. The zinc produced is in a very finely divided form, and under the microscope was seen to consist of minute spangles. The surface is such that exceptional results are obtained for precipitation, and the only possible drawback would be that the feeders now in use would have to be speeded up since the apparent volume is only one-third that of the dust now used. This apparent specific gravity gives a fluffier, lighter weight product which does not settle so quickly in paint vehicles. The covering power should also be increased. Conditions of electrolysis to give the best paint product have not been determined. It might be that the segregation of the product from sections of the series of cells might be worthwhile. There seems to be a difference in properties of the dust when solutions are high in zinc at the start of electrolysis and the dust precipitated from solutions nearly depleted in zinc. The uses of electrolytic zinc powder in organic reductions are discussed in reference cited previously.

The estimated costs of producing zinc dust from ores of the Goodsprings district are surprisingly low, and the plant cost should be moderate since all iron rather than acid-proof equipment is practicable. The use of nickel or nickel-clad units in place of iron construction in some instances may be of advantage, but our work did not determine this point. One of the main problems is the purification of solutions from carbonate, silicate, aluminate, and others. We believed that we had solved this problem, but more confirmatory tests on a larger scale would be necessary before absolute certainty. We await with interest the results of the Bureau of Mines process for plating zinc because, though we were able to make a zinc plate, the difficulty of melting this or the dust was considerable.



SHIPMENTS OF QUEBEC ASBESTOS SHORTS annually have more than doubled in the 12 years from 1937 to 1948, inclusive, fiber shipments have increased but 20% although tons of rock mined have increased 66%. In contrast, shipments of crude have shrunk from 3,845 short tons to less than 1,000 tons in this period.

New Uses for Low-Priced Fibers

Table 1. Carload Prices per Short Ton F.O.B. Mine Quebec, Canada in U. S. Funds

Standard Grade Designation	Guaranteed Minimum Test	Prices Per Ton Now Effective
No. 1 Crude		940.00
No. 2 Crude		485.00
3R Fiber	2-8-4-2	267.00
3T Fiber	1-9-4-2	249.50
3Z Fiber	0-8-6-2	231.00
4N Fiber	0-4-8-4	124.00
4T Fiber	0-2-10-4	111.50
4Z Fiber	0-1¼-9½-5	111.50
5D Fiber	0-½-10½-5	88.00
5K Fiber	0-0-12-4	88.00
5R Fiber	0-0-10-6	79.00
6D Fiber	0-0-7-9	59.00
7D Fiber	0-0-5-11	52.50
7F Fiber	0-0-4-12	49.50
7H Fiber	0-0-3-13	42.00
7K Fiber	0-0-2-14	35.50
7M Fiber	0-0-1-15	31.00
7R Fiber	0-0-0-16	30.00
7T Fiber	No test	28.50
7RF Floats	No test	31.00
7TF Floats	No test	31.00
8S Floats	No test	20.50

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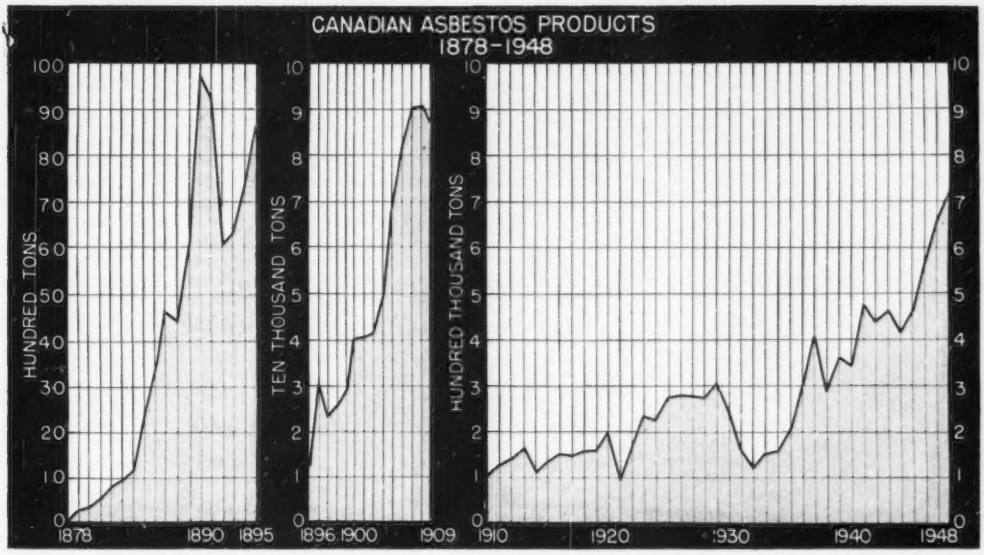
WITHIN THE PAST three decades there have been two critical turning points in the history of the asbestos industry. The first was the advent of the molded brake-lining for motor vehicles directly after the first World War. The second, occurring essentially in the last 10 years, was the greatly increased demand for the shorter grades due to the widespread development of asbestos-cement products and new uses for the shortest fibers.

Prior to the introduction of the new lining, which replaced one woven mostly from long-fiber asbestos, the attention of the mining companies had centered upon producing as much of the so-called "crudes," unfiberized in lumps, as the rock would yield. Even after demand stopped for the specialized War I requirements, which had taken large quantities of the longest fibers also, the emphasis on production of the longer grades might still have persisted, had it not been for the introduction of the new molded product. The woven brake lining previously used, with the demand for long fiber for clutch-facings, gaskets, electrical insulation and the like, readily could have absorbed the entire output of these longest, highest-priced fibers. But the comparatively sudden change in demand for fiber resulting from the introduction of the new brake lining caused the accumulation of heavy surpluses of long-fiber, crudes and spinning grades as the war ended.

Thus it came about that during World War II crudes brought as little as $220 to $650 per ton, although in 1918 they had reached a price of almost $3,000 per ton, the income from them and the spinning grades constituting the mainstay of the industry.

The effect of this change on producers will be clearer if the reader refers to Table 1, which emphasizes the wide range in the prices of the various grades classified according to fiber length.

In general, the mining companies formerly depended primarily upon the higher grades in the rock as mined to produce the major part of their gross income. Despite the new, increasing demand for the



PRODUCTION OF QUEBEC ASBESTOS, all grades, starting in 1878 with 50 short tons, passed the 10,000-ton mark in 1896 (when it was 12,250 tons) and the 100,000-ton mark in 1910 (102,215 tons). Since then, output of the Quebec companies has mounted to 716,769 tons in 1948, falling below 100,000 tons in only one year (1921).

Vital to Canadian Asbestos

shorter fibers, it is still a primary function of beneficiation to extract the asbestos with as great a length of fiber as possible, producing the maximum quantity possible in groups 1, 2, 3 and 4, listed in Table 1.

The Standard Classification. Groups 1 and 2 in the Canadian standard classification comprise the "crudes," the material being completely or partially unfiberized. They have been usually sold in lump form, hand-cobbed. The classification depends upon the unbroken fiber-length or staple, No. 1 being ¾ in. or longer and No. 2 in length being ⅜ to ¾ in.

The so-called "mill fibers," exclusive of the shorter grades, comprise Group 3, the spinning, textile and "magnesia" fibers; Group 4 the shingle stock, and Group 5 the paper or asbestos-board fiber. The "shorts" make up Groups 6 and 7 and are used primarily in making floor coverings, with many other new uses.

Groups 8 and 9 ("asbestos sand" and "gravel and stone," respectively) are of relatively minor importance.

The Quebec Testing Machine. Despite the drop in value of the crudes, it must be emphasized that, other factors such as tensile strength, color and texture being equal, the most important consideration in determining the relative value of asbestos fiber continues to be its length. The method of determining grades, universally used by producers and buyers, consists of a mechanical-screen test which originated in the Thetford district, Quebec. The Quebec standard testing machine devised for this purpose is a nest of three screens, one on top of the other and numbered from the top down, 1, 2, 3, with a "pan" at the bottom.

The representative sample is weighed into a portion totaling exactly 16 oz., placed in the uppermost box, and screened at a predetermined r.p.m. and stroke, for a definite length of time. The material remaining on each screen and in the pan is weighed separately. The fiber grade is then designated by the number of ounces comprising each of the four products (totaling 1 lb.). For example, should the buyer be purchasing a spinning fiber specified under the Quebec standard as 3T, he should be getting asbestos having a minimum test of 1-9-4-2. In other words, of the 16-oz. sample tested, 1 oz. has remained on the first screen, 9 on the second, 4 on the third, with 2 oz. of "drops" in the pan. In classifying 7th group material, a 35-mesh screen also is inserted (above the pan).

Industry Caught "Off Base." Any removal of emphasis on the salability of long fibers, therefore, could be expected to militate against the prosperity of the industry. Fortunately, a new demand developed for the shorter grades, much of which in the past had been sent to waste on mill-tailings dumps. Radical improvements in combining asbestos with cement had been effected during the inflationary twenties. Not only during that period but particularly in the last decade, the demand for fibers in Groups 4, 5, 6 and 7 increased, while, proportionately, that for the crudes and spinning grades declined. This radical change in the buying habits of the asbestos users found mining and milling techniques employed by the industry considerably "off-base" to

Table 2. Comparison of Shipments, Illustrating Growing Importance of "Shorts"

	1918			1928			1938			1948		
	Tons	Value, $	%	Tons	Value, $	%	Tons	Value, $	%	Tons	Value, $	%
Crudes	3,704	2,501,002	27.7	4,167	1,361,682	12.1	2,911	955,423	7.4	977	594,594	1.4
Fibres	138,671	6,518,807	71.9	126,973	7,636,271	67.9	163,097	9,710,899	75.3	241,953	25,943,710	61.4
Shorts	16,850	34,046	0.4	141,893	2,240,408	20.0	123,785	2,223,873	17.3	473,839	15,693,171	37.2
	159,225	9,053,855		273,033	11,238,361		289,793	12,890,195		716,769	42,231,475	

Table 3. Quebec Asbestos Producers in 1948

	Cap. Tons Rock Per Day
Asbestos Corp.*	
King	3,600
British-Canadian ..	3,000 (being increased to 4,800)
Beaver	2,400
Vimy Ridge	2,200 11,200
Can. Johns-Manville	9,600
Johnson's Company	
Thetford	2,400
Black Lake	800 3,200
Nicolet Asbestos Mines	1,800 (being increased to 2,000)
Bell Asbestos Mines	1,000
Quebec Asbestos Co.	1,000
Flintkote Mines	1,000
	28,800

*Personal letter from George Jenkins, general manager, Asbestos Corp., Ltd.

Table 4. Results of Mining and Milling Quebec Asbestos in Postwar Years, Compared with 1928

	1946	1947	1948	1928
Rock mined	9,127,859	9,837,045	10,759,016	5,171,060
Rock milled	7,027,483	7,740,828	7,894,461	4,118,044
Rejected to waste, %.....	23.2	21.3	26.6	20.5
Increase in rock mined over previous year, %.....	.....	7.8	9.0	.....
Increase in rock milled over previous year, %.....	.....	9.8	2.0	.....
Total fiber shipped, all grades	558,181	661,821	716,769	271,637
Total shorts	329,205	438,666	472,860	142,701
Fiber per ton rock mined, %.	6.12	6.72	6.66	5.16
Gross value of fiber shipped..	$25,240,562	$33,005,748	$42,231,475	$11,250,000
Per ton value of fiber shipped	$45.22	$49.87	$58.88	$41.16
Place-value per ton of rock mined	$2.78	$3.36	$3.92	$2.17

meet the greatly changed demand.

The Quebec industry[1] continues to produce some crudes from such rock as can readily be sorted over picking-belts during milling, or where contractors for the task can be put to work without interfering with shovel operations. But in 1948 the extraction of all crudes totaled only 943 tons, or 0.0088% of the rock as mined, compared with 3,397 tons in 1919 or 0.1102%.

Other Changes Result

Industry Greatly Affected. These changes in market demand, the effects of which were aggravated by the depression of the Thirties, were partially responsible for the elimination of marginal producers, the consolidation of properties and the scrapping of some obsolete mills. Construction of new and more modern plants was effected, utilizing simpler flowsheets in which use of cone crushers became general and wherein jumbos replaced cyclones. The new mills were designed to produce fewer grades. This became standard for Canadian output.

Statistics of the industry reflect these changed demands. In 1928, the Quebec industry produced 131,164 tons of all grades from Crude No. 1 through and including paper-stock. Twenty years later, in 1948, it produced 241,473 tons of the corresponding grades, an increase of only 84%, despite increases in milling capacity and the disproportionately heightened demand for shingle and paper-stocks used for making asbestos-cement products. In the same period the production of shorts rose from 142,701 to 472,860 tons, an increase of about 230%.

Fortunately, the accompanying, relatively slighter increase in production of Groups 1 to 3 finds—since World War II—a sufficiently increased demand to absorb these fibers readily. This is due to several factors, the first of which was the many applications of spinning fibers to defense requirements. (The relative scarcity of these grades has resulted in stockpiling by the United States government of certain spinning grades, more particularly those that can be used in making high-pressure steam packing and gaskets.) Secondly, some fabricators of asbestos-cement pipe, for which there is a sharp and ever-increasing demand, use a considerable amount of Group 3 fiber.

As to fibers of Groups 4 and 5, these are becoming increasingly short in supply relative to their demand for making asbestos-cement shingles, tile and siding; and sale of Group 5 material is almost equally strong for the manufacture of asbestos-cement products, etc.

Total Recovery Increased. The asbestos industry, particularly in Quebec, therefore finds itself in a fortunate position marketwise, if not in all cases minewise. Many

[1]The reader is referred to earlier articles by the author, namely those in *E.&M.J.-Press.*, Jan. and Feb., 1922, on asbestos mining and milling; also in *E.&M.J.*, Jan. and Feb., 1932, on asbestos mining and milling, respectively, in Quebec; also to an article in *E.&M.J.*, June, 1933, on the mechanical cobbing of asbestos.

producers have been able to expand the production of shorts by relatively simple and inexpensive changes in, or additions to, existing plants. On the other hand, since all plants are being worked at capacity and the production of Groups 1 to 5 now, as in the past, depends on milling capacity, efficiency and asbestos content of the ore, the increase in production of all grades necessary to a healthy supply-versus-demand level may not be forthcoming for considerable time.

Exemplifying how producers are attempting to meet these changed demands, the statement recently made by Johns-Manville shows that their "total recovery in 1928 was less than 8% while in 1948 it was nearly 13%, the increase coming largely from the shorter grades of fiber for which important uses have been developed." Production from that company's mine at Asbestos, Que., the largest in the world, reached its all-time record in 1948 of 348,000 tons of fiber output as against total shipments for the Quebec industry in that year of 714,333 tons.

However, whereas Johns-Manville increased their output of fiber from the host-rock from below 8 to nearly 13%, the Quebec industry as a whole increased total extraction by but 1.56 to 6.64%. Of the 440,000-ton increase during this 20-year period only about one-fourth, or 110,000 tons, comprise Groups 1 to 5 (crudes through paper-stock).

Table 2 shows the tonnage of crudes, fibers and shorts shipped from the Province of Quebec, the dollar value thereof and the percentage of the gross production value for each classification for the years 1918, 1928, 1938, and 1948. The change in trend in asbestos market requirements is emphasized dramatically in this table. Whereas in 1918 the crudes accounted for 27.7% of the total income and the shorts but 0.4, in 1948 the crudes produced but 1.4% of the industry's income and the shorts, 37.2.

Demand Largest in History

Increased Requirements From Three Sources. The beginning of 1950 finds the asbestos mining industry again with the largest demand for its products in history. This is due to the expanded requirements enumerated, to the renewed demand for asbestos products in the battlefield countries of World War II, and to the new demand for such materials in the so-called "backward" areas or where asbestos-cement articles are cheaper, more durable, and, on the whole, easier to get and make than the iron and steel products they replace.

Although it is true that nearly all the mills have added facilities for the increased extraction of shorts, only one plant has been built solely to retreat tailings. This is the new mill of Johnson's Company at Thetford, which is retreating material from former operations by a wet process. It has been variously reported (orally) that its capacity is 2,000-3,000 tons of tailings per day.

Two Adverse Factors

At this time, however, it is difficult to establish the relation of supply and demand in the asbestos industry because of two things which adversely affected the industry last year. The first is the general recession in business activity, the influence of which was felt early in the year. It was then becoming apparent that, while shortage of the shingle grades was still acute, the supply of shorts was almost in balance with demand.

This recession almost coincided in time and duration with a strike of asbestos workers in Quebec. The resulting 4½-month shut-down, which started in February, closed almost all of the major mines of the district—Canadian Johns-Manville, Asbestos Corporation, Johnson's Company, and Flintkote. Of the district's total milling capacity of about 29,000 tons of rock per day, nearly 25,000 tons was affected. However, many factors indicate a continuing increase in demand in the coming year at least for probably all grades of asbestos fiber.

"Vital Statistics"

1948 the Latest Normal Year. In 1948 approximately 10,800,000 tons of rock was mined. Of this roughly 7,900,000 tons was milled, yielding 716,769 tons of all grades of fiber, or 6.64%. Twenty years before, in 1928, 5,400,000 tons of rock had been mined (or almost exactly half the tonnage of 1948) and the extraction was 5.16%.

This asbestos in 1948 came from 11 mills owned by seven companies. Of the companies in Table 3, only the Asbestos Corporation and Johnson's have no associated manufacturer-outlets, that is, are not "captive" mines. As for the others, Canadian Johns-Manville is wholly owned by the Johns-Manville Corporation of New York. The Nicolet, also in the Danville region of the asbestos district, is owned by the Norristown Magnesia and Asbestos Co., of Norristown, Pa. The Bell, at Thetford, is a subsidiary of Turner & Newall, Ltd., of Manchester, England; and Quebec Asbestos, at East Broughton, is controlled by the Philip Carey Manufacturing Co., Cincinnati. Flintkote, between Robertson and Thetford, is a wholly-owned subsidiary of The Flintkote Co., of New York.

Most of these mining subsidiaries of American or English manufacture do maintain a fiber-sales department, inasmuch as they often produce grades, or a surplus of certain grades, beyond the parent company's requirement.

All except Flintkote were in existence at the time the author's 1932 series of articles were written (see footnote 1) and, though plant additions and minor improvements have been made at most of them, their basic flowsheets remain practically unchanged. Flintkote's mill, which went into production in mid-1946, also follows orthodox practice.

Two Graphs

The graph on page 77, based on figures of the Dominion Bureau of Statistics, shows the Canadian chrysotile production of all grades, 1878-1948. The production of fibers and shorts, compared with total output for the 12-year period, 1937-1948, is shown in the graph on page 76, compared with the year 1928.

In this production picture it is interesting to note that whereas in 1928, with half the tonnage of rock mined as compared to 1948 and about one-third of the total fiber produced, 3,397 tons of crudes was extracted, the 1948 output was only 943 tons. Power-shovel mining in the open pits and the use of block-caving underground, where surface mining is no longer economic, has reduced the hand-sorting of crudes drastically.

Results of mining and milling in the three postwar years are set forth in Table 4, in comparison with similar results for 1928. It is worthy of comment that each of the two periods represent peak economic inflation.

Table 4 shows that while the increase in tons of rock mined in 1948 compared to 1946 (war price controls were in effect through June of that year) is 11.8%, and the percentage increase in rock milled is 12.3, the increase in value of fiber

Table 5. Cost per ton of Asbestos Rock Mined and Fiber Produced, Quebec Industry, 1948

(Based on 10,759,016 Tons of Rock Mined)

	Gross Cost	Per Short Ton Rock Mined	Per Short Ton Fiber Produced
Salaries and wages*	$12,136,615	$1.13	$16.92
Workmen's compensation and unemployment insurance	702,317	0.07	0.98
Dryer and other fuel and electricity	2,085,673	0.19	2.91
Process supplies (explosives, drill steel, etc.)	3,068,607	0.29	4.28
Containers (bags, jute and paper)	2,702,622	0.25	3.78
Direct Operating Costs	$20,695,834	$1.93	$28.87
Taxes			
Dominion income and excess profits	2,571,611	0.24	3.58
Provincial	654,675	0.06	0.91
Municipal	260,105	0.02	0.36
	$24,182,225	$2.25	$33.72
Buildings, machinery, equipment, erected or installed during year	3,936,471	0.37	5.49
Total, including additions and replacements	$28,118,696	$2.62	$39.21

*Terminology same as used by Dominion Bureau of Statistics.

shipped is approximately 67%. This reflects the several increases in selling prices which had become effective since price decontrol. However, the disproportionate increase in value is also accounted for by the increasingly larger relative output of shorts during the three-year period. On the other hand, the desire to increase production is reflected by the fact that there was less selective mining done in 1948 which resulted in a greater percentage of waste by sorting in the pits before milling. The rock wasted between mine and mill consists not only of granite occurring almost throughout the district as intrusions in the serpentine, but also of the submarginal or barren "heads" of host-rock which occur in practically every deposit.

However, the increase in place-value of the ore from $2.79 to $3.92 per ton is due mainly to the increments in fiber selling-prices and not to a 9% increase in extraction, most of it in the short grades.

275-Day Year Raises Costs

Cost Figures for Quebec Industry. In Quebec, neither the mines nor mills work on Sunday nor on religious or national holidays. The analysis of costs and other statistics is therefore based upon a 275-day working year. Naturally, unit costs would be bettered were the Quebec mills to work the full calendar year as in many other mining industries. Furthermore, the costs and other pertinent data are for the Quebec industry as a whole, and the figures include those pertaining to small as well as large mines, old as well as new, and those with varying conditions of overburden and ore content.

The King and Johnson's companies at Thetford have been block-caving all mill feed for some years past. The Bell, at Thetford, will start within the next year or so. Preparation by Johns-Manville for block-caving is over 75% completed. Approximately one-fifth of the total tonnage for 1948 was mined by block-caving, as compared with power shovels in open pits.

Efficiency Increased

Performance Greatly Improved. The following comparison may prove of interest: in 1919, 3,567 men, on an average, including office and engineering staffs, were employed by the Quebec asbestos producers and 3,082,384 tons of rock was mined, of which 13% was sent to waste. In 1928, 3,170 workers accounted for 5,171,060 tons mined, of which 21% was sorted before milling. In 1948, the total average daily manpower was 4,959 and this personnel mined 10,760,000 tons of ore, of which 26% was not milled. In 1948, therefore, 7.89 tons of rock was mined per day per employee, compared with 3.14 tons in 1919 and 5.93 tons in 1928.

In 1928, 86.4 tons of fiber was produced for each employee for the year, and it was worth $3,550, against which he was paid $1,260. His average daily earning was $4.57 for 10 hours, or $0.457 per hour. In 1948 he produced 144½ tons of fiber worth $8,516 and was paid $2,447 on an 8-hour-a-day basis, or an average hourly rate of $1.11. The average worker in 1948 thus produced fiber worth about two and one-half times his annual output in 1928, and was paid just about double his 1928 earnings, though working 8 hours a day instead of 10.

In 1948, when four-fifths of the rock came from open cuts and one-fifth by block-caving, the direct cost per ton of all rock mined was $1.93, resulting in $28.87 per ton as the operating cost of all fiber produced. Total direct operating costs in 1928 averaged $1.05 per ton of rock mined by open-cut methods, resulting in a fiber cost of $16.94. Corresponding costs by cableways and crane were $1.67 and $26.94, while by shrinkage stoping they were $1.82 and $29.92, respectively.

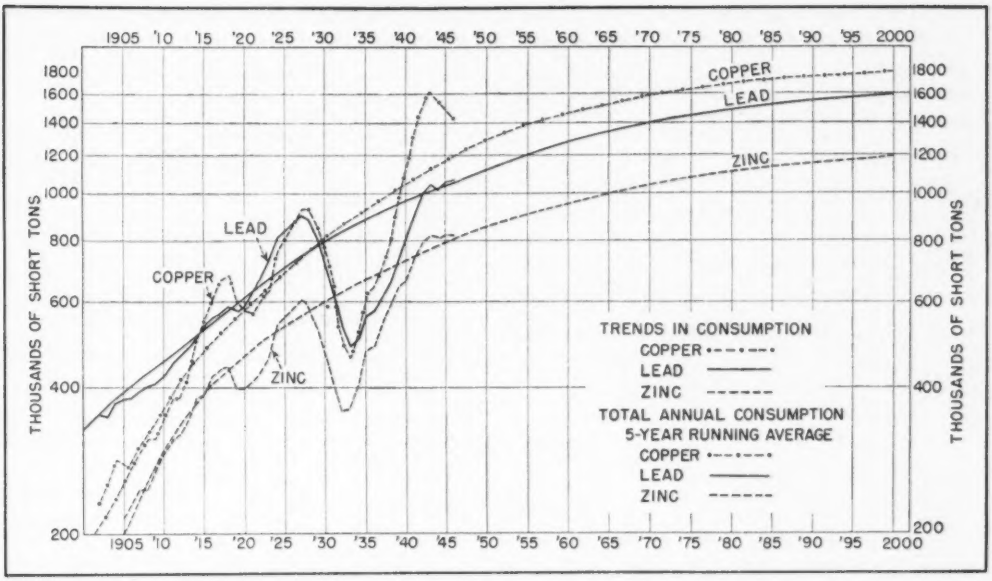
Increased Mechanization

Concluding this analysis of Quebec statistics, it will be noted that for 1948 the total installed motor horsepower in the mines, mills and auxiliaries is given as 77,786. This is about 2.78 connected horsepower per ton of mill capacity. Likewise, 175,680,000 kw.-hr. was used in the 1948 operations, or 16.3 kw.-hr. for each ton mined as opposed to 12 kw.-hr. for 1928. This reflects the increased mechanization of the industry in the past 20 years.

Drier fuel consumed approximated $600,000 in cost, or something less than $0.06 per ton of rock dried. However, for basis of comparison, it must be emphasized that 1948 was a very dry year.

The strong present and new potential demand for asbestos fiber has resulted in the stimulated exploration and development of new properties, the consideration of better techniques and proposed increases in milling facilities. These subjects will be treated in the next and last article of this series.

But before discussing those phases of the industry it might be well to emphasize that in the industry's most profitable year, the total profits, before depletion or return of capital, it is estimated, were approximately $14,000,000. The gross selling price of the shorts, most of which were formerly thrown away, was approximately $15,693,000.



TREND OF U. S. CONSUMPTION of copper, lead, and zinc over the next 50 years foreshadows increased demands.

Long-Term Demand Will Force Metal Prices Up

Will a miner get more or less for his output in the future than he does in 1950? Mr. Shea backs a higher price, believing that the world-wide metal supply problem will be colossal. Follow his reasoning, consider his conclusions, then let us have your comment. ***The Editors***

WILLIAM P. SHEA
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AT THE UNITED NATIONS Scientific Conference on the Conservation and Utilization of Resources, Aug. 17-Sept. 6, 1949, some of the facts of modern life were presented in rather startling statistics. Man's average life span has been greatly lengthened by progress in medical science, and as a result, the population of the world is expected to increase 50% during the next 50 years. By the year 2000 it is anticipated that there will be more than three billion people in the world. Against this background, the United Nations' avowed purpose to improve the standards of living of the various peoples of the world offers a basis for some interesting speculation as to how future supplies of necessary raw materials can be provided.

The United Nations have set for themselves a formidable task. Data are available to supply comparative indexes of average living standards among the peoples of the world. (See Table I.)

All available evidence indicates that, in contemporary civilization, the levels of living standards among nations are in approximate proportion to their use of metals. Obviously, if annual per capita consumption of metals throughout the world is to be increased while world population itself is increasing by 50%, it follows that the world must greatly expand its production.

The world's greatest production of copper, lead and zinc, in any one year to date, including recovery of secondary metals, seems to have been about 3,500,000 short tons of copper, 2,700,000 short tons of lead and 2,400,000 short tons of zinc, including an estimate of U.S.S.R.'s production. Compared with these figures, Table II shows the potential requirements that varying degrees of success in the United Nations' program would entail in the future if the world's production facilities were capable of unlimited expansion. Although the attainment of any of these various levels of living standards may be feasible, at least in theory, the attainment of requisite production levels from the world's presently known resources of non-ferrous metals seems most improbable.

The United States' own requirements of these metals right now are enormous and are still on a rising long-term trend. Based on our present knowledge of the world's resources, there may even be room for concern as to whether or not presently known and inferred world reserves can long continue to support even the United

Table I. How the Indexes of Standard of Living in Various Countries Are Likely to Change

(U. S. A. in 1939 = 100)	1913	1939	1948	Est. 1960	Est. 2000
U. S. A.	50	100	135	150	200
Europe—					
Ex U.S.S.R.	25	40	40	50	
U.S.S.R.	15	20	20	25	
India and Pakistan	7	10	12	15	?
China	5	5	5	6	
World—					
Ex U. S. A.	11.4	14.9	17.0	20.5	

Table II. What the Effect on Metal Consumption Would Be at Various Levels of the World's Standards of Living

Year	Population (Millions)	Index of Standard of Living	Copper (Thousands of Short Tons)	Use Lead	Zinc
The present situation:					
1948					
U. S. A.	147	135	1,344	1,129	807
World—					
Ex U. S. A.	1,915	17	1,780	1,311	1,344
Total	2,062	25.4	3,124	2,440	2,151
If there is no improvement in standards of living:					
2000					
U. S. A.	200	135	1,800	1,550	1,100
World—					
Ex U. S. A.	2,900	17	2,800	2,050	2,100
Total	3,100	24.6	4,600	3,600	3,200
If living standards remain at levels now expected to be reached by 1960:					
2000					
U. S. A.	200	150	2,000	1,700	1,200
World—					
Ex U. S. A.	2,900	20.5	3,250	2,400	2,450
Total	3,100	28.9	5,250	4,100	3,650
Providing for levels of living standards which may be reached by 2000:					
2000					
U. S. A.	200	200	2,700	2,275	1,625
World—					
Ex U. S. A.	2,900	25	3,960	2,920	3,000
Total	3,100	36.3	6,660	5,195	4,625
U. S. A.	200	200	2,700	2,275	1,625
World—					
Ex U. S. A.	2,900	30	4,750	3,500	3,600
Total	3,100	41.0	7,450	5,775	5,225
U. S. A.	200	200	2,700	2,275	1,625
World—					
Ex U. S. A.	2,900	50	7,900	5,800	6,000
Total	3,100	60.0	10,600	8,075	7,625

Table III. How Use of Non-ferrous Metals Could Increase in the Next 50 Years

(Thousands of Short Tons)

	1948			2000		
	U. S. A.	Rest of World (Est.)	Total	U. S. A. (Incr. = 34%)	Rest of World (Incr. = 34%)	a. Total
Copper	1,344	1,780	3,124	1,800	2,400	4,200
Lead	1,129	1,311	2,440	1,600	1,900	3,500
Zinc	807	1,344	2,151	1,200	2,000 (44%)	3,200
Copper				1,800	2,600	4,400
Lead				1,600	2,000	3,600
Zinc				1,200	2,100 (59%)	3,300
Copper				1,800	2,800	4,600
Lead				1,600	2,200	3,800
Zinc				1,200	2,300 (84%)	3,500
Copper				1,800	3,300	5,100
Lead				1,600	2,500	4,100
Zinc				1,200	2,700	3,900

a. Percentage of increase varied according to estimates of possible increase in world's living standards.

States' rising metals requirements.

Although the United Nations conferees seemed to be not discouraged by the magnitude of this supply problem, it is pertinent to inquire whether it is physically possible for the world to provide even a substantial fraction of these indicated added requirements.

Need for metals may be gaged, to some extent, by the case history of the United States which now absorbs more than one-third of the world's production of the non-ferrous metals.

When plotted on a ratio scale, economic data, whether pertaining to a new idea, or a new product, or a new business, or a new era in a nation's history, usually follow a characteristic pattern. This may be depicted by a curved line which, following an initial moderately upward period, moves into a period of steeply rising trend and finally rounds off once more into a plateau with a moderate upward trend.

The accompanying chart showing the comparative long-term trends of use of copper, lead and zinc in the United States depicts the latter part of the era during which industrial America attained a vigorous maturity. It would seem that the long-term trend projections of use of these three metals are now in the process of rounding off into a less spectacular upward movement which will probably sooner or later parallel the trend of population.

Although mathematically computed, these projections of trends are extremely long and represent not estimates but rather assumptions of what may be expected during the next 50 years in the light of what has actually happened during the past 100 years. Actual figures for the years 1950-2000 will undoubtedly show wide deviations from the trend projections, but from current indications the trends shown may be expected to approximate the centers of such deviations.

Taking use of the non-ferrous metals in three of the world's more populous areas as recent as the prewar years 1936-1939—

AVERAGE USE

	Copper	Lead	Zinc
	Thousands of Short Tons		
India	10	10	25
Other Far East including Japan	210	131	105
Russia—Est.	172	100	85
as compared with United States	757	634	565

and considering that the combined population of the other three is more than six times that of the United States, it may be anticipated that the curves of use for the

world outside the United States, if United Nations' plans are successful, will rise at faster rates than those now expectable within the United States.

That is, where the United States may be said, looking again at the typical trend pattern, to be rounding off into the upper, flattening-rate-of-increase part of the curve, the rest of the world on the average is just about beginning the phase of rising-rate-of-increase. This is not meant to imply that the extraordinary rates of increase which the United States has registered are to be duplicated by the rest of the world—on the contrary, a much shallower curve is to be expected. Nevertheless, its rate of increase during the next 50 years will probably be faster than that of the United States. (See Table III.)

The problem of supply is complicated by the fact that *mine production* of copper, lead and zinc in the United States apparently reached a peak during the years 1925-29 and has subsequently been on a slow downward trend despite the higher prices of today. (As compared with the average of 1925-29, increases through 1948 have been: Bureau of Labor Statistics Index of Commodity Prices 68%; combined price of copper, lead and zinc 97%.) At the same time the United States' trends of use are still rising—trends which have been so persistent for the past 100 years that it is only reasonable to assume that they will continue for a long time to come, even though the increase may be at flattening rates.

Therefore, the United States' requirements of foreign non-ferrous metals seem certain to increase, and it would be difficult to anticipate a time when the United States could not afford to pay whatever prices may be necessary to obtain such requirements.

Thus at the same time that nations outside the United States develop ambitious plans to improve their own material status by increased use of their raw material resources, they will apparently be called on to fill America's growing excess of use over production.

Metals Locate Industry

It was pointed out during the conference that reservoirs of metals-in-use may affect the location or perpetuation of industrial areas as profoundly as access to virgin sources. Thus it appears that a nation lacking natural easy access to primary sources may foster industrialization by accumulating a large inventory of metals-in-use.

The importance of national reservoirs of metals-in-use as reliable sources of needed materials is beginning to be rather sharply accentuated. Already in the United States annual reclamation of lead for re-use exceeds annual production of new lead from American mines. The U. S. Bureau of Mines, as a beginning of an appraisal of strategic metals-in-use, has established that at the end of 1948 the United States had a reservoir of copper-in-use of about 22,000,000 short tons, or 304 pounds per capita.* From this reservoir the United States currently derives by reclamation more than 500,000 tons per year of copper for re-use, a vitally important addition to the 800,000-900,000 tons won annually from American mines.

New Sources Needed

It is expectable that rising prices for non-ferrous metals will stimulate attention to national inventories throughout the world and make necessary ever increasing efficiency in reclamation of these metals for re-use.

Higher prices will also compel far greater economy than now prevails in the utilization of metals. Furthermore, sheer necessity, definable in terms of price per unit, will compel the gradual but ultimately considerable substitution of other metals in uses now performed by copper, lead and zinc. For example, it is expected that aluminum will supplant copper in many of its present functions, and that titanium will replace lead and zinc extensively in pigments, oxides, etc. Much also is expected of magnesium, which is already in large demand in the steel industry. Nevertheless, there will always remain many present uses, plus new uses certain to develop in the future, in which the peculiar individual characteristics of copper, lead and zinc will render them the preferred materials.

Highest hopes for increasing supplies of the non-ferrous metals, however, lie in the possibilities of new discoveries in vast areas of the world which are still largely unexplored. The cost of exploring such areas cannot now be estimated, but the task is certain to be undertaken, probably with the active cooperation of the various governments of the world, as metals become scarce and dear.

*It was only 68 lb. per capita at the end of 1907.

Thus, it may be accepted, tentatively, that on the basis of:

(a) Higher prices, which may prove to be very high in comparison with present standards;

(b) Increased efficiency, worldwide, in the reclamation of metals for re-use;

(c) Large substitution of other materials in some uses;

(d) Widespread use of modern methods of geophysical and geochemical exploration;

adequate supplies of non-ferrous metals can be made available to meet probable future world requirements. Therefore, it is pertinent to ask to what extent the nations of the world are likely to achieve their objectives in raising the standards of living.

Success Possible

It may be noted, first of all, that certain factors highly favorable to such achievements are in operation:

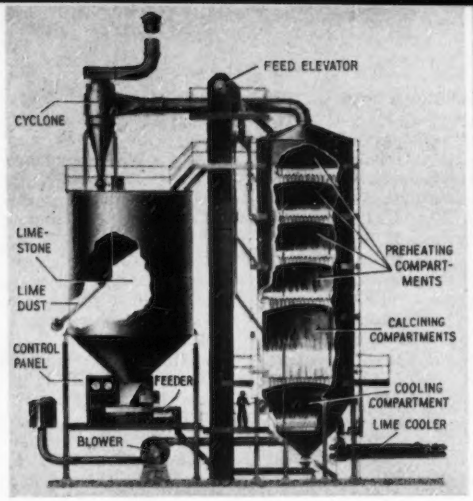
First, ambitions of national leaders all over the world toward the greater material well-being of their peoples are thoroughly awakened. The visits to the United States of Prime Minister Nehru and the Shah of Iran and the recent activities of Marshal Tito in the economic field are important examples of this awakening.

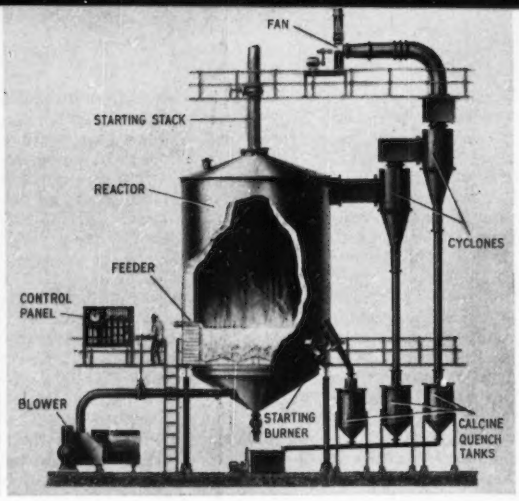
Second, in the current world of rapid communications and transport, and of scientific weapons, political stability and national security impose upon strong nations an active self-interest in the economic growth and well-being of the weaker nations, particularly those with large populations.

Third, in capitalist countries, particularly in the United States, there are important outward pressures of surplus private capital, engineering and business know-how, and individual initiative constantly seeking foreign markets. These pressures are likely to increase in the future.

Thus both the incentives and the pressures actually are at work which could assure the realization of much of the United Nations program.

Taking all factors into consideration, we are compelled to conclude that, unless some cataclysm changes the course of human progress, there will be substantial increases in world production and use of the non-ferrous metals, but at greatly increased prices, whether expressed in monetary terms or in exchange for other commodities.





SPECIAL LIME KILN at left produces 100 tons burned lime daily at lower cost than conventional kilns. Product is superior. Roaster at right treats arsenical gold ores, offers advantages in roasting copper, zinc, iron ores.

FluoSolids For Roasting

Developments point toward better control, improved product, lower cost for roasting or drying sulphides, iron ores

T. B. COUNSELMAN
Stamford, Conn.[1]

FLUOSOLIDS STARTED in the petroleum industry, where it is known as "suspended solids technique." Catalysts had been used for a long time in petroleum refining to help get higher yields of the better-grade fractions of crude oil. The trouble was that in fixed-bed catalyst plants, carbon built up on the catalyst and blinded the bed.

Briefly, to get around this difficulty, a bed of the catalyst is partially suspended, or fluidized, in a stream of petroleum vapor in a reactor under proper temperature. The hydrocarbons reform, leave some carbon on the catalyst, then go on to fractionating columns, where the various fractions are picked up.

The carbon-coated catalyst, being fluidized, overflows continuously and is blown to a regenerator, where hot air keeps the bed fluid and burns off the carbon. The clean catalyst goes back to the reactor.

This principle obviously offered possibilities for solid-gas reactions in other than the petroleum industry. The Dorr Co. was licensed by Standard Oil Development Co. in January, 1943, to use the suspended solids technique in non-petroleum, non-catalytic fields.

The technique, to which we have given the name of FluoSolids, consists of the partial suspension of solid, non-catalytic, particles in the gaseous stream. This produces an effect almost exactly comparable to the sorting action in the column of a hindered-settling classifier.

Bed Acts Like Fluid

With FluoSolids, however, the gas velocities are such that size segregation of properly prepared feed will not occur. The entire fluidized bed, which is in turbulent motion like a boiling liquid, is substantially uniform throughout. By "properly-prepared" I mean a feed that is crushed to such a size that the desired velocity of air stream will fluidize the bed. For example, limestone must be crushed to 6 mesh; iron ore, to 14 mesh, because of its greater specific gravity, and so on. Suitable adjustment of velocities will fluidize all particle sizes down to zero.

A FluoSolids reactor can handle the extremely fine sizes without too much carry-over because the gas velocity drops so sharply when it leaves the bed. That is, the velocity of the air and combustion products, etc., through the interstitial spaces within the fluidized bed may be quite high, but in the freeboard of the reactor directly above the bed, the gas velocity is much lower. Most fine particles that may be swept out of the bed drop back in at this point. Ultimate dust loss of the system is entirely dependent on the degree of gas cleaning employed.

Fluidized material has several interesting properties. It will flow like water into and out of reactors. It will exert a gravity head, which is used to effect movement of the fluid mass. If heat is introduced, either with the gas or as a fuel with the solids, the fluidized bed, because of its violent movement, quickly reaches a uniform temperature throughout the bed.

This temperature can be accurately controlled, either by control of amount of fuel, of amount of excess air, or both. In roasting sulphides, temperature control is by automatic introduction of a small amount of water, or air, thermostatically controlled to hold the bed at the desired temperature.

FluoSolids roasting or calcining differs from other forms of the process in that the amount of air or other gas introduced is under

[1]Manager, FluoSolids Division, The Dorr Co., Stamford, Conn. Based on an informal talk before the Minerals Beneficiation Division of the American Institute of Mining & Metallurgical Engineers, Feb. 14, 1950, in New York.

positive and exact control. The only air or gas that can get into the roasting or calcining chamber is that deliberately introduced through the low-pressure blower (2 to 7 lb.).

Consequently, conditions in the reactor are under exact control. A desired stack gas analysis can be produced; a high CO_2 content in burning lime, or a high SO_2 content in roasting sulphides. Producer gas can be used in magnetic roasting of iron ore. Chlorine could be used for other chemical reactions.

Efficient Heat Exchange

Fluidized solids provide an efficient heat exchange mechanism. Reactors can be built with several compartments, one above another. The fluidized solids then overflow down transfer pipes between compartments. Then, if the calcining compartment is next to the bottom, the hot gases, traveling upwards, fluidized each compartment in turn, and give up more and more of their sensible heat to the incoming raw feed. In the same manner, the hot calcine overflows into the lower, cooling, compartment, where it is cooled by incoming cold air. In turn, this air is pre-heated before entering the calcining compartment.

Still another attribute of fluidized solids is the manner in which fuel can be introduced. Gaseous fuel, of course, is simple. The gas simply goes in through ports and burns in the excess air put in to fluidize the bed. If oil is the fuel, Bunker C oil may be shot in without atomizing in small spurts by means of a Hills-McCanna slide-burner pump. The oil momentarily coats the surfaces of the red-hot solids. These being in violent motion promptly spread to all parts of the bed. The oil then vaporizes and burns so completely that not a trace of carbon or discoloration is left on the calcined product. Powdered coal has been used successfully in much the same way.

The multi-compartment reactor shown in the sketch is currently producing lime, using Bunker C oil as fuel, for a heat consumption of less than 5,000,000 Btu. per ton of lime produced. Rotary kilns usually consume about 6- to 8,000,000 Btu. per ton. The best shaft kilns, where only lump stone can be used, usually require about 6,000,000 Btu.

Similar multi-compartment reactors can be used for magnetic roasting of iron ore. Reducing gas enters the bottom of the reactor, but only a portion of it is consumed in reducing the hematite or limonite. The remainder burns in the upper compartments with air introduced through nozzles. This brings the raw ore up to reducing temperature.

Magnetic roasting of iron oxides uses 750,000 to 1,000,000 Btu. per ton of feed, neglecting any heat recovery. About half of this is recoverable, however. Of the iron units occurring as oxide, 92% will be converted to magnetite. After suitable grinding, the calcine will yield a magnetic concentrate of as high, or higher, grade as obtainable with other methods of concentration such as flotation, tabling, etc.

A simpler form of FluoSolids reactor is a single-compartment unit, a type which has been in use for two or three years in Canada roasting arsenical gold ores. Another of these is under construction at the new Golden Cycle mill at Cripple Creek in Colorado, also for roasting gold ores.

The close control of the FluoSolids reactor offers many advantages in using this single-compartment type in roasting sulphides. In roasting pyrite or pyrrhotite it is entirely feasible to produce a calcine having just the right amount of residual sulphur to furnish fuel for a subsequent sintering step, to produce an agglomerated iron oxide, for example. Also, the SO_2 content of the exhaust gas is unusually high, 14 or 15% being easily obtainable with pyrite.

Zinc concentrate can be calcined to a dead roast, or enough sulphur can be left for fuel in making retort zinc. Zinc solubility in dead-roasted concentrate is usually higher with FluoSolids than in conventional roasting. The amount of soluble iron is definitely lower. The close temperature control minimizes formation of ferrites. SO_2 content of exhaust gases may run as high as 10%.

Easier Copper Recovery

Copper sulphides can be sulphatized with FluoSolids, making the copper water or weak-acid soluble. Results will vary somewhat, but calcines have consistently been obtained in which as much as 90% of the copper is water-soluble, with an additional 5 to 9% soluble in 5% sulphuric acid. At the same time, close temperature control allows only 1 to 1.5% of the iron to go into solution.

Two important applications suggest themselves: First, copper sulphide concentrate could be roasted, then leached, then treated electrolytically, by-passing the smelter altogether. Second, copper-gold ores, which could not be cyanided because of the copper, could get a sulphating roast, followed by a water or weak-acid leach for the copper and cyanidation for the gold.

This same effect could be used to produce blast furnace feed from cupriferous pyrite. In one such case, conventional methods of roasting invariably yielded an iron oxide carrying 0.6% to 0.9% copper. Leaching did not touch the copper. Obviously ferrites had been formed. FluoSolids, on this same concentrate, produced a calcine that leached down to 0.11% to 0.2% copper, well within the 0.4% limit for the steel industry.

To roast sulphides, the FluoSolids reactor is pre-heated to a temperature that will ignite the sulphur. Thereafter combustion will be self-supporting, assuming that there is enough sulphur in the feed. This minimum sulphur content is lower for FluoSolids than for other types of roasting operations. For example, in Canadian plants roasting arsenical gold ores, the normal flotation concentrate carrying 12 to 15% moisture has to have at least 27% sulphur to be self-roasting. With FluoSolids, treating filter cake of 12 to 15% moisture, sulphur content can go as low as 12% and roasting will still be self-sustaining.

Sulphides Self-Roasting

The reactor can be shut down for a considerable time and started up without difficulty. The feed is simply stopped, the air shut off, and the bed, no longer fluidized, remains hot for hours. When air and feed were turned on, the reactor quickly regained temperature.

Another interesting application of the FluoSolids principle is in drying materials, such as sand, phosphate rock, or any crystalline material. At the same time a split at sizes between 35 and 100 mesh can be made if desired. In general, FluoDry, as it is called, consists essentially of a single-compartment reactor having an external chamber where fuel for drying is burned.

There are many other applications of FluoSolids on which we are working, but it is too early as yet to give details. The process is licensed to users for a reasonable royalty, and the equipment can also be furnished by the Dorr Co. on a turnkey basis.

KEEPING TAB ON PRACTICE

A Steel Bit's Performance. Charles E. Cook, general manager, Paymaster Consolidated, South Porcupin, Ont., states that 179,957 holes, totaling 1,259,691 ft., were drilled with Hayes detachable steel bits last year. This required 43,700 new bits and 455,500 reforged bits, giving an average of 2.52 ft. Resharpenings per bit exceeded seven. The dovetail bit is bought only in 1⅝-in. gage, and successively resharpened down through the following sizes: 1⅝ in., 1 9/16 in. (both with two resharpenings frequently), 1½ in., 1 7/16 in. and 1⅜ in. Used bits are sandblasted, and weighed on a postal-type scale for sorting to correct gage. A competent man sorts up to 1000 per hour. One heater and two resharpener operators consider reforging 1600 bits a shift's work.

Hayes Steel Products, Ltd., (Merritton, Ont.) is preparing for efficient production of its PM-type bit, which it expects will attract attention despite current interest in detachable carbide bits and carbide-tipped steel. Its tests convince it that, as a machine-shop practice, tungsten carbide undoubtedly finds a place but is not the economic answer for every condition.

The sampling moil, with detachable carbide tip, previously introduced by Hayes, is said to show much faster cutting speed in one large gold mine due to longer retention of the sharp point, especially in toughest ground. Footage has ranged from 400 to 791, with five to six regrinds.

Hayes is also working on a light, fast-hitting rock drill using an air leg, in view of the current interest in this type of machine in connection with carbide-tipped drill steel.

Education for Insert-Bit Users. Milford Tool Co., Milford, Conn., which has developed a line of carbide-insert bits ranging from 1⅝ to 2½-in. in diameter in ⅛-in. increments, holds that the individual must be educated. Principles stressed by the company are:

1. Limiting the footage between grinds to prevent excessive wear on the carbide.

2. Controlling the quality of the drill steel, and gaging the threads.

3. Regrinding the bits to conform with original angles and clearances, so far as this is reasonably possible.

4. Applying the same drilling principles as learned with the steel bit, save that fewer changes are required, longer life between grinds is possible, and considerably faster drilling speed is obtained.

Following results were obtained on a construction job, engineered by Milford:

Total footage drilled, ft.	75,000
Total rock removed, cu. yd. ...	80,000
Rock character	medium-hard (Connecticut average)
Total cost of carbide bits	$1,100
Bit cost per foot	$0.013
Resharpenings, average	5
Average footage per bit	1,200

Millford also claims good performance with special bits as large as 3⅝-in. in contract drilling under water.

A Renewable Stud. Rip Bits, Ltd., of Sheffield, England, say the chief difference between their Riploy bits and other carbide-tipped percussive bits is the renewable stud. It was designed to overcome the type of breakage widely experienced with other types of attachment elsewhere. They justify it on the basis that it surmounts the difficulty of finding a connecting member, the potential life of which equals that of the carbide insert. This type of bit is used in limited quantities on the Rand, where, owing to the practice of drilling 3½ ft. "stab" holes, the trend, so far as carbide-tipped bits are concerned, is to use the tipped, one-piece jumpers already mentioned.

Rip Bits, Ltd., has also just introduced its "Reverse Z" PM detachable bit. This bit is said to clear itself in soft ground, clippings getting past more easily. While particular efficiency is claimed for it in drilling coal, it is considered useful also for various types of soft rock. It is available in four wing diameters from 1½ in. to 1⅞ in. and is interchangeable on the same rod with the four-point cross bit.

Carbide Bits Abroad. In a mine in India, in one week and working 24-hr./day, a crosscut was recently advanced 50 ft. in very hard ground with low air pressure. The machine was a 2½-in. Holman Handril mounted on an airleg and using carbide bits (Holbits). In comparison with this, the standard performance is 24-ft. advance in the same period using four or five heavy machines.

In another instance, in Canada, in driving a 5 x 7-ft. heading in very hard tourmaline, a round of 29 holes 6 ft. deep was drilled in two shifts using these Holbits and an airleg-mounted 2⅝-in. Handril. Here, with the regular practice of using 3½-in. power-feed drifters with detachable steel bits, the best performance had been to drill a round of 27 5-ft. holes in four shifts.

In stoping, in the same Canadian mine, results obtained with a 2⅝-in. auto stoper and carbide bits of the same make as before were: 16 10-ft. (average) holes per shift, breaking 53.3 tons. Using detachable steel bits in a 3⅛-in. stoper (auto) only five 6½-ft. holes were drilled each shift, yielding a total of 11.4 tons.

The Holman company (Camborne, England) has developed light power-feed one-man drifters for feed lengths up to 6 ft. for drilling with its carbide bits. In designing them, use was made of new light alloys. For example, the slide cone cradle, though 65 in. long, weighs only 22 lb. The same light cradle can be used with the larger drifters.

In the early stages of the development of carbide drilling it was assumed that a drill striking light rapid blows would be necessary to obtain an economic carbide bit life. To this end, Holman modified the 2⅝-in. Handril by shortening the piston stroke, increasing the blows per minute from 1,900 to 2,300 (and reducing the weight of blow from 36 to 29 ft.-lb. However, they say that no increase of bit life resulted and drilling speed decreased about 5%. Production of the modified machine has been discontinued.

This company has developed a track-mounted hydraulic jumbo for one, two or three booms as desired. The chain-feed drill mounting is designed for 7-ft. steel changes, suited for carbide drilling.

Further Experience With Carbide. An Eastern iron mine, using 1½-in. Timken carbide bits with the "H" thread and 1-in. Q.O. carbon-steel rod in GD S73N sinkers, has obtained a footage of 160 per bit and a cost of $0.099 in drilling 11,700 ft. With the same bit, thread, and rod in a GD R91 stoper, 160.2 ft. per bit was drilled at a cost of $0.081 per foot in a total of 39,590 ft. The lower cost per foot with stopers is ascribed largely to buying in bigger lots.

In heading work, the same company got 170 ft. per bit at $0.096 per ft. for 21,142 ft., using 2-in. I-R carbide bits and 8-ft. steel, with a No. 2 thread cut on carbon-steel rod, in a jumbo-mounted 3½-in. GD drifter. Later, to increase drilling speed a change was made to 1¾-in. I-R bits, with a No. 1 thread on the rod. Footage per bit was raised to 184, cost per foot cut to $0.081 for 25,780 ft. drilled.

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MARKETS—Trends and Prices (*Continued from page 53*)

United States Lead Refinery Statistics

(American Bureau of Metal Statistics)

Total supply of refined lead as reported by all of the primary refiners in U.S.A. including some secondary lead produced by them; plus three secondary refiners originally included as producers of soft lead. This accounting is far short of the total production of secondary lead. Figures in tons.

	Stock at Beginning	Production—Primary	Production—Secondary	Production—Total	Total Supply	Stock at End	Domestic Shipments
1947	48,088	541,065	42,651	583,716	631,804	21,787	608,421
1948	21,787	511,356	33,913	545,269	567,056	40,647	522,999
1949:							
Jan.	40,647	48,775	1,889	50,664	91,311	38,656	50,440
Feb.	38,656	42,254	2,497	44,751	83,407	38,514	41,652
Mar.	38,514	51,373	2,574	53,947	92,461	56,737	28,368
April	56,737	48,957	1,193	50,150	106,887	72,347	16,743
May	72,347	51,206	399	51,605	123,952	94,132	19,792
June	94,132	45,455	974	46,429	140,561	100,117	30,017
July	100,117	38,332	950	39,282	139,399	94,201	34,894
Aug.	94,201	37,754	1,608	39,362	133,563	76,782	36,059
Sept.	76,782	34,928	996	35,924	112,706	61,433	29,566
Oct.	61,433	46,246	964	47,210	108,643	66,005	23,738
Nov.	66,005	48,500	723	49,233	115,228	65,954	37,779
Dec.	65,954	48,896	847	49,743	115,697	71,412	23,486
Totals		542,676	15,614	558,290	598,937		372,534

Beginning July, 1949, figures are not strictly comparable with those for earlier months, as one secondary plant is omitted. In instances where the figures are not in balance it is due to shipments to other than domestic consumers.

Official London Prices

The British Ministry of Supply continues to fix delivered prices of copper, lead and zinc for the United Kingdom. Quotations in effect as February ended were as follows:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	153	0	0
Fire refined, high conductivity	153	0	0
Fire refined, high grade	152	10	0
Fire refined, min. 99.7 percent	152	0	0
Fire refined, min. 99.2 percent	151	10	0
Hot rolled black wire rods (a)	162	11	3
LEAD:			
Soft, foreign duty paid	97	0	0
Soft, Empire	97	0	0
English, refined	98	10	0
ZINC:			
Foreign (G.o.b.) duty paid	85	10	0
Domestic (G.o.b.)	85	10	0
Prime Western and debased	85	10	0
Refined and electrolytic	86	5	0
Minimum 99.99 percent	87	15	0

(a) English rods.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

(February 28, 1950)

Aluminum, ingot, 99 plus percent, lb. (base price)	17c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	30.53@
Bismuth, ton lots, lb.	**$2.00**
Cadmium, commercial sticks, delivered, lb.	$2.00
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb.	**$1.80**
Indium, troy oz.	**$2.25**
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	**40c.**
Magnesium, 99.8 per cent, carloads, lb., producer's plant	**20½c.**
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$66.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$71.00
Selenium, 99.5 percent, lb.	$2.00
Silicon, minimum 97 percent, spot, carloads, lb.	16.50c.
Tellurium, lb.	**$1.75 nom.**
Thallium, 100 lb. or more, lb.	**$15.00**
Titanium, 96 to 98 percent, lb.	$5.00

(a) Includes U. S. duty

METALLIC ORES

Beryllium Ore, imported, 8 to 12% BeO, per unit	$26.00@$30.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 48% Cr_2O_3, 2.8 to 1 ratio	$32.50
48% Cr_2O_3, 3 to 1 ratio	**$35.00**
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	**$8.10**
Mesabi bessemer	**$7.85**
Old Range non-bessemer	**$7.95**
Mesabi, non-bessemer	**$7.70**
Lead (Galena), 80 percent, Joplin, Mo., ton	$147.67
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, 74 @ 76c., c.i.f. U. S. ports, duty extra. Long-term contract prices nominal.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	54c.
Tantalite, 60% concentrate, per lb.	$2.00@$2.75
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, duty paid	**$17.50@$18.00**
Domestic, scheelite, 60 percent and upward	$28.50
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	**27½c.**
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$55.00

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½c.
Cobalt Oxide, 72%, metallurgical grade, per lb. of Co	**$1.95**
Copper Sulphate, 100 lb.	**$7.00**

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of contained Be	**$24.50**
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	**20.50c.**
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$172.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo. contained	$1.13
Ferrosilicon, 50 percent, per lb. of contained Si	11.3c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$2.25
Ferrovanadium, per lb. of V contained	$2.90
Silicomanganese, 1½ percent C, per lb. contracts	**8.95c.**
Spiegeleisen, per long ton, 19@21%	$65.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$960@$1,050
Crude No. 2	$492@$550
Spinning fibers	$232@$475
Shingle fibers	$95.50@$141
Paper stock	$78.50@$88
Waste	$58
Shorts	$27@$52
Vermont, f.o.b. Hyde Park:	
Shingle stock	$97.00@$107.00
Paper stock	$68.50@$85.00
Waste	$51.00
Refuse or shorts	$25.50@$46.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$11.50@$12.00
Missouri, 92 to 94 percent $BaSO_4$, per short ton	$9.00@$9.50
Bauxite, long ton:	
Domestic, crude, 50 to 52 percent (not dried)	$4.00@$5.00
Domestic, chemical, 55 to 58 percent	(a)$8.50@$9.50
Domestic, abrasive, 80 to 84 percent	$18.00@$18.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, airfloated bulk	$8.50@$9.50
North Carolina ceramic grade	$18.00@$20.00
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh	$18.50
Glass spar, white, 20 mesh	$11.75@$12.50
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois, 70% effective, CaF_2, ton	$37.00
Acid 97% concentrate, bulk, ton	$42.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$30.50@$31.00
Mica—Domestic f.o.b. mines, Punch, 12 to 22c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 70 to 75c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.40@$1.50; 3 x 3 inch, $1.70@$1.80; 3 x 4 inch, $2.10; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $120 @ $130 per ton. Bulk sales, dry ground, $32.50@$60.00 per ton. Scrap, $30 and up.	
Ocher, Georgia, ton, in sacks	$24.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	(a)12@14c.
Sulphur, Texas, mines, long ton	$18.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50@$20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50

(a) Nominal

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$46.00
Steel, f.o.b., Pittsburgh billets, net ton	**$52.00**
Structural shapes, 100 lb.	$3.40

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WASHINGTON REFLECTIONS

McGraw-Hill Washington News Bureau

CIO's Ouster of Mine, Mill Union May Upset Industry's Labor Relations

It's now official: The International Union of Mine, Mill and Smelter Workers no longer is affiliated with the CIO.

Mine-Mill, one of the eight unions that founded the CIO in 1936, was tossed out by the CIO Executive Board on Feb. 15 by a vote of 34-6.

Basis for the expulsion were the findings of a CIO trial committee, adopted by the CIO Executive Board, that Mine-Mill's policies and activities were directed towards achieving the program and purposes of the Communist party rather than the objectives of the CIO.

The trial committee's report, detailing the findings, confirms evidence published more than once in the columns of *Engineering and Mining Journal* showing that the union was under Communist control.

The existence of a "secret apparatus" in Mine-Mill through which orders of the Communist party became official policies of the union was disclosed by a former Communist and one-time member of the Mine-Mill Executive Board, Kenneth Eckert. Eckert pulled a large group of castings locals out of Mine-Mill in 1948 and took them into the CIO United Automobile Workers, where Eckert now holds a high position in the UAW-CIO's Castings Division.

Eckert, trained at the Lenin School in Moscow, testified that he and Maurice Travis, now Mine-Mill's Secretary-Treasurer, were one of four members of the union on a Communist party steering committee which determined Communist policy within the union. (Travis last fall announced his withdrawal from the Communist party under Taft-Hartley pressure.)

This committee topped the Communists' systematic apparatus in the union for making decisions and translating them into union policy, according to Eckert. The committee consulted frequently with high Communist party leaders and met regularly with an envoy from the party who served as a liaison between the union and the Communist party.

Decisions of this steering committee, Eckert related, were then placed before a "progressive caucus" of all the Communists and pro-Communist leaders in the union. Invariably, the Communist decisions were adopted by the caucus, then brought before official bodies of the union and adopted as union policies.

This was the "transmission belt," the CIO trial committee found, by which decisions of Communist party leaders became decisions of the Mine-Mill union.

Eckert and Homer Wilson, former vice president of the union, were the chief witnesses in support of the charges against the Mine-Mill leadership.

In its findings, the CIO committee said that: 1. The Communist party, not the Mine-Mill membership, placed Travis in the key post of executive assistant to President Reid Robinson. Travis had been in the union only two years. He had been expelled from the CIO Steelworkers union in 1941 as a Communist disrupter.

2. The Communists decided that Robinson should resign as president after he had admitted soliciting a loan from an employer with whom the union had a contract. He is now a vice president.

3. After Travis succeeded Robinson as president, the Communists decided that his Communist affiliation was too well known for him to function effectively as president.

4. The Communist party steering committee decided to put in the presidency John Clark, who now fills that post, because he was not known as a Communist follower but could be relied upon to go along with Communist decision.

5. Of the Mine-Mill staff, 90% are members of the Communist party.

6. In the past three years, based on per capita tax payments to CIO, Mine-Mill membership has fallen from 100,000 to 65,000 and to 44,000 last October.

7. "The policies and activities pursued by the group which dominates the Mine, Mill and Smelter Workers brands them as unfit to associate with decent men and women in free democratic trade unions."

Travis appeared before the trial committee, but refused to answer questions put by the committee concerning Eckert's charges of Communist influence, thus leaving them uncontradicted. Instead, Travis denounced the CIO and the trial committee.

The trial committee, headed by Jacob Potofsky, president of the Amalgamated Clothing Workers, cited the findings in 1947 of another CIO committee, also headed by Potofsky. That committee, trying to heal the breach between John Driscoll, New England leader, and the Mine-Mill leadership, also found that Travis was letting the Communists influence Mine-Mill policies.

Serving with Potofsky on this year's committee were Joseph Curran, president of the National Maritime Union, and Emil Mazey, secretary-treasurer of the United Automobile workers.

What now?

No new union or organizing committee is being established by the CIO. But the left-right feud that has been growing stronger in the past few years will become more intense.

Several CIO unions, chiefly the steel and auto workers, will try to take over Mine-Mill contracts. This will mean more labor strife and Labor Board elections for the mining industry in the next year or two.

Even before Mine Mill was expelled, the CIO had under consideration the wishes of Driscoll to shift his Progressive Metal Council from the CIO's shipbuilding union to the steel union. PMC represents about 20,000 workers who pulled out of Mine-Mill in 1947.

About 5,500 workers in the western states are reported already to have shifted to the steel union.

CIO President Philip Murray thinks union membership in metal mining can be boosted to 150,000.

Treasury's Depletion Fight Stalled for Year

Secretary of the Treasury Snyder's demand for lower percentage depletion rates before the House Ways and Means Committee last month isn't likely to make much difference this year, at least to mining. Congress will balk at touching depletion allowances, but Treasury's insistence might force a paring of the 27½% rate granted to oil companies.

Or Treasury might try a squeeze play whereby non-metallic mineral producers not now getting depletion would be brought into the act, but at a 5% rate. At the same time, all nonmetallics would be cut to 5%.

Metal mining seems assured of its 15% percentage depletion. At least no real effort has been made thus far to cut it. Certainly the depletion question is loaded with political dynamite. More than half the 48 states have oil or gas fields; all produce minerals of one kind or another. In an election year, Congress will be especially sensitive to that fact.

Secretary Snyder asked that Congress reduce depletion allowances for oil and gas from the present 27½% to 15%; for sulfur, from 23% to

15%; and for non-metallic minerals, from 15% to 5%. The 5% on coal would be unaffected, and he is not going to touch the 15% allowance on metallic minerals "at this time." Some people detect an ominous note in those three words.

The mere threat of cutting percentage depletion allowances brought a storm of protest from mining and oil state congressmen. Sen. Pat McCarran (D., Nev.) accused the Administration of following a "shotgun approach," that the mining industry needed tax relief, not more taxes. He cited the National Minerals Advisory Report which blames "excessive taxation" for mining industry troubles. Sen. William Langer (R., N. D.) charged the Administration with trying to ruin the mining industry. Rep. Walter S. Baring, freshman Nevada Democrat, pointed out that a decrease in depletion allowances would imperil our national economy and security. Others joined in the protest.

Biggest howl, however, came from petroleum interests. They were hit hardest by Treasury's testimony before the committee. Secretary Snyder recommended that oil and gas depletion be cut the most. And he singled out this industry as having reaped the biggest harvest from depletion allowances.

Here taken from the text are the main Administration points as they were presented by Secretary Snyder during detailed testimony on special depletion allowances for mineral properties:

Depletion allowance is a "major avenue of escape from income tax."

"Percentage depletion continues to be deductible even after 100% of the invested capital has been retrieved tax free."

He charged the minerals industries (namely petroleum) with getting double deduction, in some cases, for recovery on the same capital investment. This is due to the fact that certain development costs are treated as current expenses and deducted immediately without reducing future percentage depletion.

" . . . total revenue loss . . . due to excess depletion was nearly $250-million in 1946 and $400-million in 1947."

" . . . 70 percent of the total excess was deducted by manufacturing enterprises (notably in the petroleum field) representing large integrated firms whose predominant industrial activity was not mineral extraction."

" . . . for every $3 allowed as percentage depletion another $2 was deducted as development costs." Deductions for exploration costs and losses on abandonment were substantial.

"Nearly all of the development cost deductions were taken by oil and gas producers." They "also claimed most of the allowances for exploration and losses on abandonment."

" . . . about three fourths of the total depletion allowances and of the excess of percentage over basis depletion was received by very large corporations, with assets of at least $100-million.

"In ten illustrative cases . . . the effective rate of tax on net economic income (based on cost or basis depletion) varied from 63.5 per cent to as low as .6 of 1 percent . . . a striking difference between rates of tax actually paid and the general statutory rates on such income, which ranged as high as 90 percent in these years (1943 to 1947)."

Aluminum Industry Seeks Higher Tariff

The U. S. aluminum industry is starting to feel the pinch of increasing foreign competition. U. S. aluminum imports are increasing rapidly while exports are falling off. Right now relief is sought by trying to get the President to invoke the escape clause of the Reciprocal Grade Act. If the move succeeds duties on crude and wrought aluminum will be raised back to 1945 levels or higher.

First company to file for relief was Reynolds Metals Co., Inc., late last month. It claims imports have skyrocketed since tariff reductions negotiated at Geneva became effective January 1, 1948.

Before long the Aluminum Company of America, Kaiser Aluminum and Chemical Corp., and the Aluminum Association will file separate but supporting statements showing injury due to the flood of aluminum coming in from abroad.

Under the act, the Tariff Commission will investigate these claims and recommend action to the President. The President can follow the Commission's advice or not as he wishes. At present, duties on crude and wrought aluminum are the lowest in history, 2c and 3c per pound respectively. The 3c tariff on aluminum sheets, plates, bars, coils, etc., represents the full 50 percent reduction below the 1945 6c lb. rate allowable under the Reciprocal Trade Act. The 2c crude tariff is a 33% reduction, down from 3c lb.

The Reciprocal Trade Act permits the President to raise, as well as lower, tariffs 50 percent from the base 1945 rate. This is what the aluminum companies are asking. They want the duty on wrought products raised back to the 1945 rate and upped another 50 percent as well. This would make the duty on crude aluminum 4.5c and on wrought products 9c per pound.

Actually there is little chance that the Tariff Commission will go this far in any case. There is a good possibility it won't recommend any relief. Administration sentiment against tampering with negotiated tariff reductions is strong. It runs counter to our role as the world's greatest creditor nation; it would make future negotiations more difficult; and might well result in retaliatory action by other countries.

This will be the second time the Tariff Commission has run a full scale investigation and reported to the President on a request for relief under the escape clause. The first time, last year, involved spring loaded wooden clothes pins. No change in duties resulted.

There is no way of telling just how this effort to increase tariff protection will pan out. But whatever the outcome, it will set a precedent for other cases which are bound to follow as U. S. industry feels more and more the impact of industrial expansion the world over, especially in Europe. U. S. businessmen will watch this case closely.

Washington Briefs

• The House passed unanimously and sent to the Senate H.R. 6406 which would allow work on a mining claim prior to July 1, 1949, to be credited to the year ending July 1, 1950. It does not grant an additional moratorium, only clarifies the present law. It should pass the Senate without trouble.

• Prospects for S.2105 the O'Mahoney mine subsidy bill, are good. It has passed the Senate. The House Public Lands committee has amended and approved it. As we went to press, it was jammed up behind FEPC on the House floor.

• Rep. J. T. Patterson (R., Conn.) introduced H.R. 7151 to continue import duty exemptions on copper for another two years until 1952. Even he doesn't give it much of a chance.

• Rep. Walter S. Baring, freshman Democrat from Nevada, introduced H.R. 6896, a new bill that would exempt mines from federal taxation for the first five years after starting commercial production. It would also make profits to the investor tax free for five years after first dividends are declared. It is similar to the Canadian system.

• President Truman signed into law a bill exempting tin ore imports from duties levied on their gold content. It is designed to benefit those firms using a new process for extracting low grade tin ore.

• The President asked for an end to the 3 percent tax on transportation of commodities. He'll get this and a lot more besides, when Congress passes an excise tax cut bill this session.

• H.R. 834, the contract settlement amendment, vetoed by the President last year and locked up in the Judiciary Committee ever since, may be reported out soon.

• The Senate, Feb. 20, reinstated the Senate Small Business Committee. The Mines and Minerals Subcommittee of this group used to be one of the most active and vocal in the Senate. It looks as though the Subcommittee would soon be back in business.

PERSONAL NEWS

Wing L. Lew, Oakland, Calif., returned to Argentina early in February as general superintendent for Cia. Minera Aguilar in the Province of Jujuy, which is the country's largest lead-zinc producer. The Aguilar staff also includes **D. M. Wade, Jr.**, assistant general superintendent; **C. W. Hawn**, mine superintendent; **H. K. Lancaster**, mill superintendent; **F. M. Spencer, Jr.**, geologist and chief engineer. **G. A. Hansen** and **J. G. Reilly, Jr.**, are joining the Aguilar staff this month as assistant mine and assistant mill superintendent, respectively. **D. B. McGilvra** is general manager of South American operations for St. Joseph Lead Co., Aguilar's parent organization.

HUGO L. JOHNSON, general superintendent of the Midvale plant and ore purchasing department of U. S. Smelting, Refining & Mining Co. since April, 1949, was appointed manager of the Midvale plant, effective Jan. 1. Mr. Johnson came to Utah as superintendent of the gold and silver parting plant at Midvale in 1933. He became night superintendent at the Midvale plant in 1938, assistant smelter superintendent in July, 1939, and assistant to the manager in 1946.

B. D. Stewart, territorial commissioner of mines in Alaska for the past 30 years, has retired. Before going to Alaska in 1910 with the Alaska-Treadwell Gold Mining Co., he worked in Idaho mines for eight years. Mr. Stewart became consulting engineer for the Alaska-Juneau Gold Mining Co., was appointed mines director in 1919, and in 1935 was made commissioner.

T. A. Mitchell has been appointed general manager of Tennessee Copper Co. succeeding the late **J. M. Houser**. **C. H. McNaughton** has been made production manager; **P. Norton**, chief clerk to the business assistant; **R. R. Burns**, assistant to the manager, and **R. E. Barclay**, chief clerk.

James L. Taylor, chief engineer for the potash mine and refinery of International Minerals & Chemical Corp., Carlsbad, N. M., has been appointed construction engineer for the entire corporation. He will be located in the central engineering division offices at the corporation headquarters in Chicago, and will serve directly under **Thomas M. Ware**, chief engineer. Mr. Taylor has been with the organization for the past 10 years.

Erik Anker was recently appointed managing director of Titan Company A/S of Fredrikstad, Norway, to succeed Dr. **Gustav Jebsen**, who retired after 28 years with the company. The announcement was made by National Lead Co. Mr. Anker was export manager of the Norwegian Aluminum Co. from 1935 until 1937, when he became sales manager of Titan Company.

Joseph H. Reid has been appointed by National Lead Co. as manager of the Titanium Division. He succeeds **D. W. Robertson**, former general manager, who will continue in a consulting capacity. Mr. Reid joined the company in 1927 with the St. Louis Smelting & Refining Co. He later became production manager of the Baroid Sales Division, and was transferred to the company's general office in 1941.

Evan Just, editor-in-chief of *Engineering & Mining Journal*, is devoting half his time for the current six months to the organization of a drive to obtain a better tax climate for new mining investments. He is working in cooperation with the American Mining Congress and affiliated mining associations, the Mining & Metallurgical Society of America, and others.

Edward P. Fleming, consulting metallurgist of the American Smelting and Refining Co. since 1929, retired Feb. 1. He will continue to serve the company as a part-time consultant. Mr. Fleming joined AS&R in 1906 at the Garfield smelter and later served as field metallurgist, touring United States and South American properties. In 1929 he was assigned to the New York office as a consulting metallurgist, and in 1933 returned to Salt Lake City. Upon his retirement, Mr. Fleming was honored by regional representatives of the mining industry at a banquet.

Dr. D. F. Kidd has been elected chairman of the B. C. section, Canadian Institute of Mining & Metallurgy for 1950. He has also been elected vice president of the Institute for District 6, which includes British Columbia and Yukon. **Harold M. Wright**, consulting metallurgical engineer, and **E. C. Roper**, general manager of Britannia Mining & Smelting Co., Ltd., have been elected first and second vice chairmen, respectively. The administrative committee of the section, composed of Vancouver men, includes **L. G. R. Crouch**, **F. A. Fortier**, **B. I. Nesbitt**, **Dr. J. E. Armstrong**, **Arthur Freeson** and **J. A. Pike**. Members of the executive committee are **Dr. J. S. Stevenson**, **W. G. Hatch**, **George Mill**, **R. R. McNaughton**, **Emil Brounland**, **Dr. W. V. Smitheringale**, **J. R. Giegerich** and **J. M. Cummings**.

A. C. DesBrisay, Vancouver, B. C., has been elected a director of Torbrit Silver Mines, Ltd., to fill the vacancy caused by the death of the late **J. H. C. Waite**. **J. A. H. Paterson**, of Toronto, succeeds Mr. Waite as president of Torbrit, and **N. C. Urquhart**, Toronto, is the new president of Mining Corporation of Canada, Ltd. **H. L. Roscoe** has been appointed vice president of Mining Corp. and president of Quemont and Normetal Corp. **J. Y. Murdoch**, president of Noranda Mines, has been named a member of the Mining Corp. board.

ALAN PROBERT, metallurgical engineer, U. S. Smelting, Refining & Mining Co., has resigned after 23 years with the company and its subsidiaries. He will return to Mexico for the U. S. Bureau of Mines in charge of the cooperative program which the Bureau's Foreign Minerals Region is carrying on with the Mexican Government. Mr. Probert was sent to Pachuca, Mexico, in 1935, following assignments at Nome, Alaska, Eureka, Colo., and Midvale, Utah. When the Mexican subsidiary, Compania de Real del Monte, was sold two years ago, he was transferred to Fairbanks, Alaska.

Leslie H. Donald, purchasing agent at the Calumet division of Calumet & Hecla Consolidated Copper Corp., has been appointed director of purchases and supplies for the division. He served in both the timekeeping and supply departments before his appointment as purchasing agent in 1948. **Edward A. Medlyn**, assistant

[redacted] MINING COMPANY

TEST DATA

DEPARTMENT Grinding

OBJECT of TEST

We have to increase capacity from 160 to 225 Tons/24 hours. Now have 6'4" I.D. x 6' long overflow ball mill. MARCY states all we have to do is convert to MARCY GRATES -- Check This. How about 7'x6' overflow?

OPERATING CONDITIONS

At Present: Mill, 6'4" ID x 6' long - Overflow - Closed Circuit, 25RPM
79.1% C.S., H.P. input 102.0, Tons/24hrs. 160, KWH/ton 11.5
Ball Consumption 2.8#/ton, Grind 11.3% + 65 Mesh

After Installing MARCY Grate discharge head: Mill, 6'4" ID x 5'6" long - Grate discharge - Closed Circuit, 25RPM, 79.1% C.S., HP input 112.0, Tons/24 hours 226, KWH/ton 8.9, Ball consumption 2.6#/ton, Grind 10.2% + 65 Mesh.

SUMMARY	Overflow	MARCY Grate		REMARKS
Mill Size	6'4" x 6'	6'4" x 5'6"		Lost 6" by putting in Grates
Tons/24 hours	160	226		Feed remained the same
KWH/ton	11.5	8.9		Looks like we save 22½%
Ball Consumption	2.8#/ton	2.6#/ton		Some saving here
Grind	11.3%+65M	10.2%+65M		Better grind

By converting to MARCY GRATES we gain 41.3% in tonnage and at the same time we save 22½% in power. Mine & Smelter evidentally correct.

Recommend we do not purchase bigger overflow mill.

F. C. Ulacheuser
Mill Supt

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THE Mine & Smelter SUPPLY COMPANY

AMONG THOSE attending the annual convention of the New Mexico Miners & Prospectors Association, held in Silver City, N. M., Jan. 19-21, were Don Lusk (left), of Albuquerque, editor-publisher of the *New Mexico Miner & Prospector*, and James K. Richardson, manager of the Utah Mining Association, of Salt Lake City, Utah. William H. Goodrich, general manager, Chino Mines Division of Kennecott Copper Corp., Santa Rita, was elected president for 1950, to succeed George Warner. Principal speaker at the meeting was Evan Just, editor of *Engineering & Mining Journal*.

purchasing agent, and formerly with the Superior and Isle Royale mines, succeeds him.

Leo H. Saarela has been appointed commissioner of the Alaska Territorial Department of Mines to succeed **B. D. Stewart**, retired. A graduate of the University of Alaska in 1938, he worked for the Cleary Hill Mines Co. from 1938 to 1941. In 1941 he opened the Territorial Department of Mines' assay office in Anchorage and served as assayer. During the war he was assistant to Mr. Stewart while Mr. Stewart was purchasing agent for the Metals Reserve Co. Mr. Saarela became a member of the University of Alaska's department of mining extension after the war and later became head of that department.

L. G. Immonen has been appointed concentrator superintendent of Kennecott Copper Corp.'s Nevada Mines Division at McGill, Nev. A graduate of Michigan College of Mines, he succeeds **F. M. Jardine**, who recently retired.

Edwin Sweetman, mining engineer of Green Bay, Wis., was a recent business visitor in Kansas City and Minneapolis. While in Minneapolis he attended a meeting of the owners of the Nicollet Hotel.

A. H. Miller, consulting engineer of New York, is doing an extensive examination and appraisal job in Western Canada, Western United States and Mexico.

Dr. Charles F. Park, Jr., has been named dean of the Stanford School of Mineral Sciences. He succeeds **Dean A. I. Levorsen**, who will remain on the Stanford University faculty as professor of geology, but who wishes to devote his time to teaching and research in petroleum geology. Before joining the faculty, Dr. Park was with the U. S. Geological Survey for 15 years. He is best known for his work on the iron deposits of the Lake Superior region, gold deposits of the Southern Appalachians, zinc and manganese ores of Washington and the hydrothermal alteration of the copper metals.

M. M. O'Brien, managing director of Bralorne Mines, Ltd., was re-elected president of British Columbia & Yukon Chamber of Mines at the annual meeting in Vancouver in January. Other officers are: **Dr. Harry V. Warren** and **S. J. Crocker**, vice presidents and the following members of the executive committee: **Dr. W. B. Burnett, Angus R. Campbell, Charles M. Campbell, Harry O. Dyer, G. S. Eldridge, Horace Fraser, Henry L. Hill, Archie D. MacGillvray, Dr. Joseph T. Mandy, Dale L. Pitt, Morley Shier, Matthew Sutton, D. S. Tait, Ross Thompson** and **A. M. Whiteside.**

R. F. Goodwin, vice president, American Smelting & Refining Co., and **H. A. Kursell**, consulting engineer, have returned after spending several weeks inspecting the company's mining activities in Peru and Bolivia.

J. D. MacKenzie, vice president and **R. P. Reese, Jr.**, assistant to the president, American Smelting & Refining Co., have recently completed a trip to the United States smelters of the company.

D. D. Irwin sailed Feb. 16 from New York for a visit to Roan Antelope Copper Mines and Mufulira Copper Mines in Northern Rhodesia. He will join **R. L. Prain**, managing director of these mines, in Capetown, and with him will visit O'okiep and Tsumeb.

Several scholarships, valued at $1,000 annually, have been made available at the School of Mines, Columbia University, by **Henry Krumb.** These scholarships will be awarded to students interested in mining, metallurgical and mineral engineering. Mr. Krumb, a graduate of Columbia, in 1898 worked as a draftsman, assayer, mine superintendent, chief engineer, and was with the Guggenheim Exploration Co. as investigator from 1904 to 1907.

Dr. Harold Mooney, formerly at the California Institute of Technology, is now with the University of Minnesota's School of Mines & Metallurgy in the department of geophysics.

Hugh Leach, superintendent of the Hill-Trumbull mine, was elected chairman of the Minnesota section of the American Institute of Mining & Metallurgical Engineers at the recent annual meeting in Duluth.

Theodore A. Anderson, mining captain at Cleveland-Cliffs Iron Co.'s Mather "A" mine, retired Jan. 1. Mr. Anderson was in charge of the mine from October, 1940, when preparatory work for sinking the "A" shaft was begun, to the end of 1949. **Hugo Korpinen** has been promoted from operating engineer to underground superintendent in full charge of all underground operations at Mather "A."

GEORGE D. DUB, consulting engineer of Los Angeles, has been named chairman of the Southern California section of the American Institute of Mining & Metallurgical Engineers for 1950. He has been a member of AIME since 1918 and has been active in Southern California mining circles for many years. Mr. Dub represented the Southern California section at the annual meeting held in New York in February.

Albert T. Koenen, superintendent of Oliver Iron Mining Co.'s Trout Lake concentrator, has been named supervisor of beneficiation. **W. P. Morris** has been appointed his assistant, and **K. F. MacAlpine**, superintendent of Oliver's washing plants at Trout Lake and Marble, Minn.

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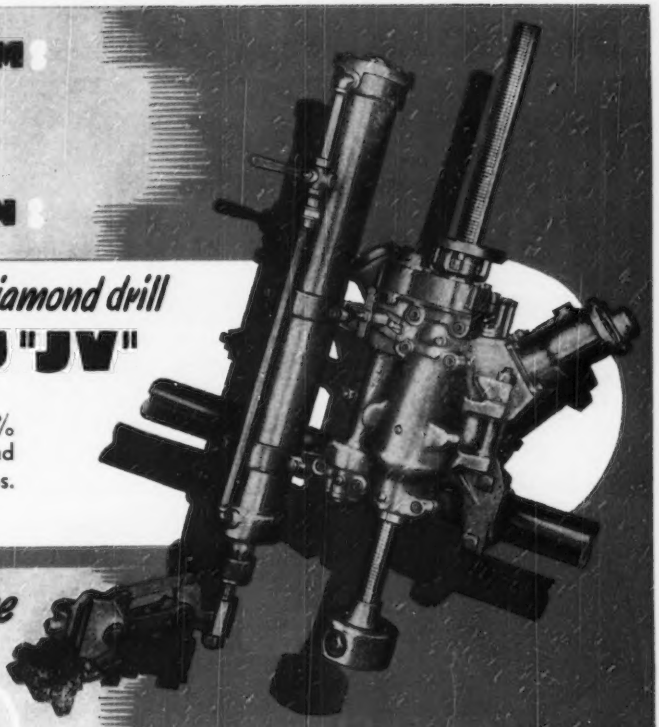
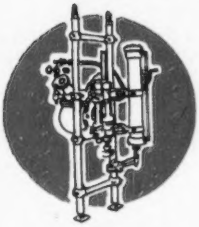


But if you must have

DEPTH—



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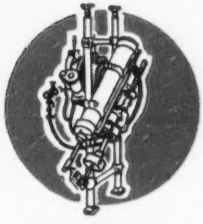
Handles all underground requirements up to 800 ft. Rugged air driven motor, four feed speeds. Total weight: 524 lbs.



BBU-2:
New screw feed swivelhead incorporates four instant change gear feeds. Available with geared hoist and/or rod pullers. Capacity, 1800 ft. with "E" rods, 1400 ft. with "A" rods.

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BBU-JR.:
Combines simplicity, flexibility, with minimum weight. Capacity 200 ft. with "E" rods, 400 ft. with XRT rods. Total weight with rod puller: 190 lbs.

Practical job tests throughout the world have established that our model BBU-JV is the most powerful underground diamond drill of its size on the market today. For core drilling or blast-hole work it has the extra power needed for maximum efficiency at lowest operating cost. *In harder formations it has no equal.*

Drilling capacity: 1½" hole size, 15/16" core size	500 ft.
Net weight with rod puller	352 lbs.
Heaviest piece	95 lbs.

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WALTER B. HESTER, production manager, Baroid Sales Division of the National Lead Co., was recently named secretary of the Southern California section of the American Institute of Mining & Metallurgical Engineers. C. W. Six was named treasurer.

Donald M. Davidson, vice president of E. J. Longyear Co., has been appointed by the Secretary of Interior to serve on the National Minerals Advisory Council.

Phelps Adams, chief of the Washington Bureau of the *New York Sun* for many years, has been made a special assistant on the Public Relations staff of **J. Carlisle MacDonald,** assistant to the chairman of the board, United States Steel Corp.

Wallace Woods Agey, metallurgist, has been transferred from the Salt Lake City metallurgical station of the U. S. Bureau of Mines, to the Mexico City headquarters of the Bureau. Mr. Agey, a Colorado School of Mines graduate in 1939, has been with the Bureau since 1940.

A. N. Wold, chief engineer for Inter-State Iron Co. since 1944, retired Dec. 31, 1949. He joined the Inter-State company in 1918 at the Hill-Annex mine at Calumet, where he later became chief engineer. In 1941 he moved to Virginia as assistant chief engineer for all company mines. **Howard T. Caddy** has succeeded Mr. Wold as chief resident engineer and **William A. Benson** has been appointed his assistant. Mr. Wold will continue to act in a consulting capacity for the company.

E. C. Bradley, of Iron Mountain, has retired from the firm, E. C. Bradley & Sons, which has operated mines for the Jackson Iron & Steel Co. for more than 20 years. The business will be continued under the same name by **Wayne E.** and **Bruce C. Bradley.**

The Oliver Iron Mining Co. recently announced a number of changes in personnel. In the Hibbing-Chisholm district, **Evald V. Nelson,** general pit foreman, has become assistant superintendent at the Morris and Pillsbury mines. **Hamilton P. Brown,** shop foreman, has been promoted to assistant general shop foreman for the dis-

trict. In the Canisteo district, **H. F. Bolton**, general pit foreman, has been assistant superintendent at the Arcturus and Gross-Marble mines. **Elmer J. Olson**, assistant superintendent of the Soudan mine on the Vermilion range since 1940, has been transferred to the Fayal open-pit and underground operations at Eveleth, on the Mesabi. **Earl M. Holmes**, general underground mining captain in the Virginia-Eveleth area, has been promoted to assistant superintendent of the eastern district in charge of the Soudan mine.

R. H. Bassett, chief engineer of the M. A. Hanna Co. for the past 32 years, retired Jan. 1. He will continue to act as consulting engineer for the company. **R. O. Buck**, assistant chief engineer since 1941, has succeeded Mr. Bassett.

Edward R. Gloyd, formerly with Phelps Dodge Corp. at Bisbee, Ariz., is now with the U. S. Bureau of Mines at Duluth as safety representative.

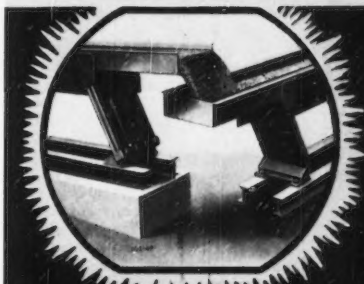
IRA L. WRIGHT, consulting mining engineer of Silver City, N. M., was among those attending the annual convention of the New Mexico Miners & Prospectors Association, Jan. 19-21. Mr. Wright is a director of the organization.

Bennett R. Bates, consulting engineers of New York, has moved to Ganges, Salt Spring Island, British Columbia, where he will continue to carry on a limited amount of consulting work.

Luis Coelho Correa daSilva, metallurgist of Sao Paulo, Brazil, has been awarded a doctor's degree in metallurgy by Carnegie Institute of Technology. He is the first Brazilian to hold the title of Doctor of Science in metallurgical engineering. A graduate of the Escola Politecnica in Brazil, he was a member of the staff of the Research Institute of the State of Sao Paulo before coming to Carnegie, where he worked with **Dr. Robert F. Mehl**, director of the Metals Research Laboratory and head of the metallurgical engineering department. Dr. Correa daSilva has returned to Sao Paulo to rejoin the Research Institute's staff.

Charles F. Willis, secretary of the Arizona Small Mine Operators Asso-

ANNOUNCING THE



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● Jeffrey announces the new MV conveyor which incorporates in its design those essentials which have made Jeffrey-Traylor electric vibrating equipment so successful.

1. **BALANCED OR TUNED VIBRATION** is employed. The MV conveyor operates at Positive Resonance (Natural Frequency)—resulting in attractive power savings. Conveying speeds and capacities are maximum possible.

2. **VIBRATION IS ISOLATED** within the machine itself. Supporting structures receive no vertical or horizontal thrusts — need only be strong enough to carry the dead weight of the equipment and its material load. No massive concrete structures are required.

3. **FLEXIBILITY OF DESIGN** provides ruggedness required for any conveying job and permits the use of open or enclosed pan or tubular conveying decks. Floor or suspension mounting is available without loss of capacity.

4. **POSITIVE CONVEYABILITY**, uniform at controlled depths horizontally, downhill or uphill as steep as 10°. Abrasive wear on decks is negligible due to hopping action of material (animated suspension).

5. **MATERIALS HANDLED** . . . Abrasive, lumpy or rough materials, hot or cold, wet or dry equally as well as softer, finer materials.

For complete details

of construction, write for the Jeffrey MV (Mechanical Vibrating) Conveyor bulletin No. 826 or consult a Jeffrey Engineer.

PATENT PENDING

JEFFREY ...ESTABLISHED 1877

THE JEFFREY MANUFACTURING COMPANY

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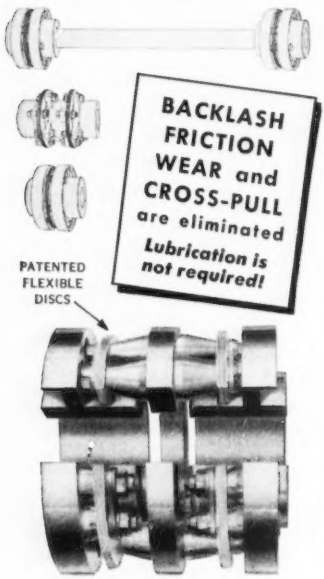
THOMAS
Flexible ALL METAL
COUPLINGS
FOR POWER TRANSMISSION
REQUIRE NO MAINTENANCE

Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
1 to 30,000 RPM

Specialists on Couplings for more than 30 years



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT.

NO MAINTENANCE PROBLEMS.

ALL PARTS ARE SOLIDLY BOLTED TOGETHER.

Write for the latest reprint of our Engineering Catalog.

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

ciation, has been reappointed a member of the National Minerals Advisory Council.

C. B. Ashby, assistant superintendent of the Magna plant of Kennecott Copper Corp.'s Utah Division, retired Jan. 31 after serving the company since June 1, 1905. He joined the company at the Copperton experimental mill in Bingham Canyon, and transferred to the Magna operation in 1907. From 1911 to 1916 he worked as general mill foreman at Ray Consolidated Copper Co., Hayden, Ariz., at Chino Copper operations in Hurley, N. M., and at Thane, Alaska. In 1916 he became general foreman at Magna, and in March, 1939, was made assistant superintendent. **F. M. Barton,** general mill foreman, will succeed Mr. Ashby.

Sinclair B. McCoy, general traffic manager for International Minerals & Chemical Corp. for the past five years, has been appointed assistant to **A. Norman Into,** vice president in charge of the potash division. **Eugene J. Landis,** formerly assistant to Mr. McCoy, will succeed him as general traffic manager. **Ronald A. Ellwing,** who has been chief clerk of the traffic department, will become assistant general traffic manager.

W. Arthur Wall, formerly with the Rhokana Corporation, Northern Rhodesia, has joined the staff of the Cobalt Chemical & Refinery Co., Ltd., of Cobalt, Ont., as chief technical executive of the company's cobalt division. Mr. Wall directed research in the leaching process for production of cobalt metal. **Oscar Fischer,** of Denver, Colo., has also joined the staff. He instituted the roasting technique used by Rhokana in their cobalt process. He was also instrumental in solving problems experienced in treating refractory ores of the Flin Flon district in Canada. **John Johnson** is directing the company's silver smelter operation.

David D. Baker, consulting engineer of Bishop, Calif., has returned to California after attending the annual meeting of the American Institute of Mining & Metallurgical Engineers in New York, Feb. 12-16. Mr. Baker is engaged in the mine development and mill construction program at the Minnietta lead mine near Panamint Springs, Calif.

OBITUARIES

Harvey L. Garrity, general superintendent of operations for Kennecott Copper Corp.'s Utah division, died suddenly Jan. 11, in Salt Lake City. He was 48. Mr. Garrity joined Kennecott as a rodman on an Alaskan survey in 1923, and subsequently served as safety engineer at the Bingham open-pit mine, general track foreman, and assistant mine superintendent and superintendent of mines. He had been advanced to general superintendent of operations less than a month before his death.

Leonard Larson, general superintendent of the Reduction Plant of Kennecott Copper Corp. at McGill, Nev., since 1930, died Feb. 13 at Ogden, Utah. A graduate of the University of Utah, he joined Kennecott with the Nevada Mines Division as assistant control chemist and experimental man. Together with **Byron T. Berge,** Mr. Larson was responsible for the development of mechanical tuyere punchers at McGill and at the time of his death he had been scheduled to present a paper entitled "History of the Development of Mechanical Tuyere Punching at the McGill Smelter" at the annual meeting of the American Institute of Mining & Metallurgical Engineers in New York.

JAMES F. McKEONE, superintendent of the Vulcan Steel Foundry, Vulcan Iron Works, died Jan. 24, after a brief illness. He was 61. Prior to 1944, when he joined the company, he served as superintendent of the Strong Steel Foundry Co. of Buffalo, N. Y., for 18 years.

George Zapp, retired mining engineer, died Jan. 11 at Victorville, Calif., where he had lived for the past 10 years. He was 80. Mr. Zapp had served as mine superintendent for the Golden Queen Mines, Mojave, Calif., for the Belmont mine, Superior, Ariz., and for several mines in Mexico.

Charles G. Walker, 69, veteran western mining engineer and surveyor, died recently in Beatty, Nev.

Alvin A. Steel, well-known Roswell, Idaho, farmer, and mining engineer, died in December following a brief illness. Born in Omaha, Neb., in 1877, he received his early education there, and later graduated with a B. S. degree in civil engineering from the University of Nebraska. He entered Columbia University where he obtained a mining engineering degree in one year. For a number of years Mr. Steel worked in various capacities at mines in North and South Carolina, Michigan, Northern Mexico and the West, gaining valuable information and experience. He also did extensive examinations of mines all over the

country. In 1905 he joined the staff of the University of Arkansas as assistant professor of mining. He soon advanced to a full professorship and also served as Acting State Geologist of Arkansas. In 1913 when his health failed, he was compelled to give up his first love, mining, and move to his father's fruit ranch at Parma, Idaho. It was there that he became interested in fruit growing and farming, and after his health was completely recovered he remained there to continue the expansion of his orchards and general farm.

R. P. Weidenfeller, 63, chief engineer for Oliver Iron Mining Co. in the Canisteo district since 1919, died at his home in Coleraine, Jan. 28. He joined the Oliver company in 1912.

Frank Drake, consulting engineer, died Jan. 14 in San Francisco. He maintained an office in Boston, and later in San Francisco. Mr. Drake was a graduate of Michigan College of Mining & Technology, where he received B. S. and E. M. degrees.

Dr. Howard Grenville Bohlin, 57, geologist and mining engineer, died in January of a heart attack. He was former assistant curator of City College, in New York. Dr. Bohlin was educated at Columbia University School of Mines and New York University. He joined the Southern Minerals Co. and later became superintendent of the Big Four Mining Co. in charge of nitric acid production. He also served as mining engineer and assistant geologist for the Midvale Steel Co. and at one time was chief engineer for American Smelting & Refining Co.

Harold Darling, of Melbourne, Australia, died Jan. 26. He was often called Australia's "man of steel" and had been a leader in the country's iron and steel industry for 27 years.

Mrs. Mae Paul Mouat, 67, wife of M. W. Mouat of Nye, Mont., died Jan. 1 after a long illness. She was prominently identified with her husband in the famous Mouat chrome and nickel properties near Nye. She took an active part in the development of these properties for 30 years.

J. H. Waite, 61, president of the Mining Corporation of Canada, died recently in Toronto.

Forest D. Goody, pioneer Colorado miner and authority on rare metals, died recently at his home in Denver. He was best known for his invention of the Goody automatic gold saving device, and was also holder of patents on mining processes and devices. He was 73.

George Keith Kimball, mining engineer of Idaho Springs, died recently at the age of 81. He was a graduate of the Colorado School of Mines and after mining in many parts of the United States, he returned to Colorado to operate the Old Town mine, near Idaho Springs.

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Christensen Diamond Core Bits are designed and manufactured to perform under all drilling conditions for maximum cutting efficiency and core recovery.

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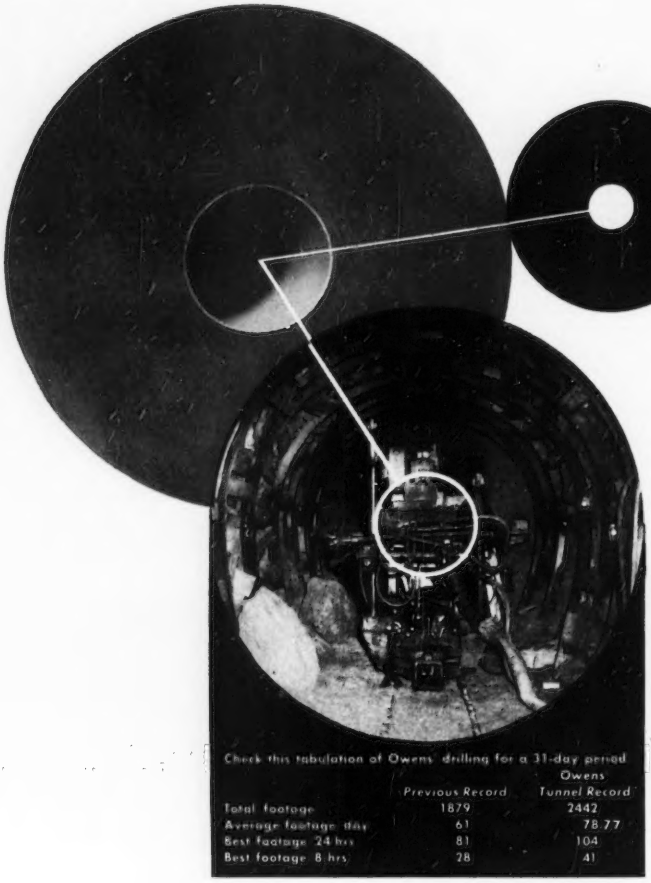

Check this tabulation of Owens' drilling for a 31-day period

	Previous Record	Owens Tunnel Record
Total footage	1879	2442
Average footage day	61	78.77
Best footage 24 hrs	81	104
Best footage 8 hrs	28	41

"we set three world records with CRUCIBLE HOLLOW DRILL STEEL!",

says George W. Foster Supt.
Owens Tunnel Contractors

George Foster and his crew have established three enviable drilling records. Working on three tunnels, each 10,000 feet, for the Los Angeles Department of Water and Power . . . Mr. Foster's tunnel specialists have drilled 4100 feet in tunnel #1; 4300 feet in #2; and 5000 feet in #3. Throughout this record-breaking operation, Crucible Hollow Drill Steel 1 1/8" round is used exclusively.

Setting records like these takes men and tools that can stand up and take the punishment of around-the-clock operation. *Pre-tested* Crucible Hollow Drill Steels are built to give rugged service even under the most severe field operations. *Every lot* of Crucible Hollow Drill Steel is backed by Crucible's half century of specialty steel experience. Our metallurgists can help you with your drill steel problems. Write us stating full details. CRUCIBLE STEEL CO. OF AMERICA, Chrysler Building, New York 17, N. Y.

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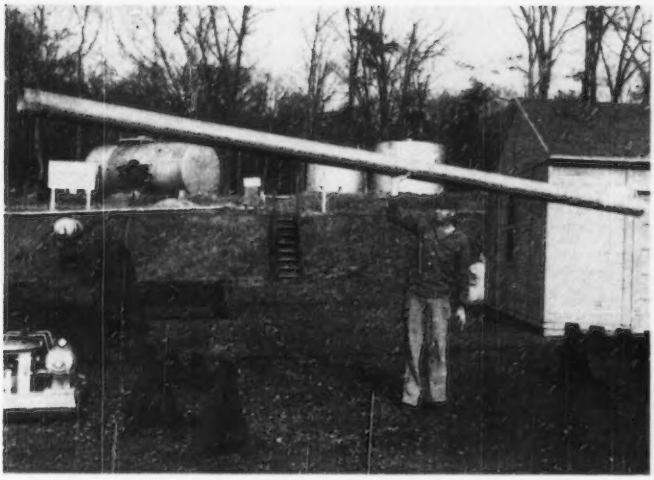
NEW PRODUCTS DIGEST

For further information on these products, circle item numbers on card-insert and mail.

PREVIEW

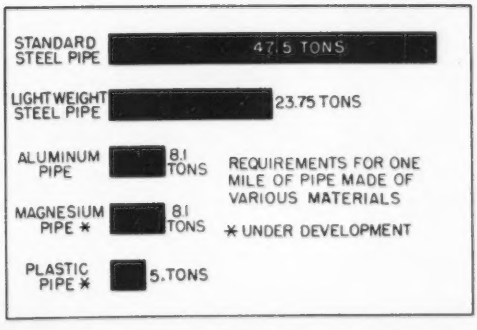


(1)

Courtesy of Department of Defense

BRUTE STRENGTH isn't needed to lift this section of 6⅝-in. pipe since it only weighs 2 lb. per ft. Translucency is also an advantage of fiber glass pipe.

Fiber Glass Pipe Is Tough, Light, Non-corrosive



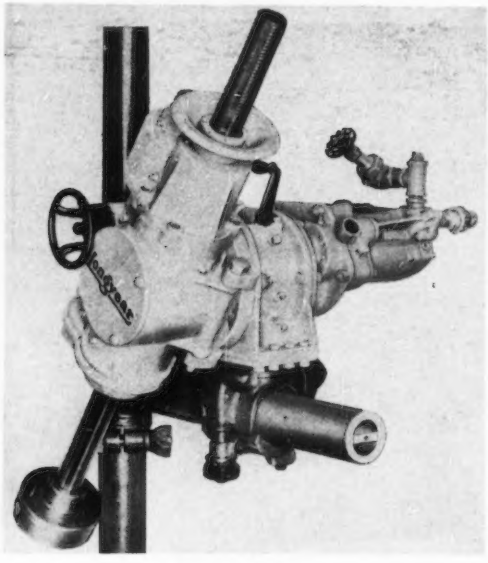
SAVINGS in shipping and handling pipe on the job are reflected in this chart.

FOR THE FIRST TIME, standard 6⅝-in. outside diameter pipe is being made of fiber glass. Although primary interest in its development lies with the military, its combined characteristics of toughness, light weight and non-corrosiveness should make it attractive to industry in general.

Cost of fiber glass is still high, but its basic material, sand, is not a critical item. Other favorable factors are its translucency, which permits the shadow of the liquid within to be seen, and its ease of manufacture. It offers relatively easy "set-up" requirements for industry.

Test samples, 4¾ in. in diameter indicate a burst pressure of 2,500 psi., and impact values of more than 20 psi. Wall thickness is less than ⅛ in. A 20-ft. section of the 6⅝-in. fiber glass pipe weighs 40 lbs. A similar section of steel pipe weighs 185 lb.

According to experts of the Engineering Research and Development Laboratory, fiber glass pipe made from sand and synthetic resin may eventually replace the cumbersome metal type for military petroleum distribution in the field.



Core Drill Has Two-Speed Transmission (2)

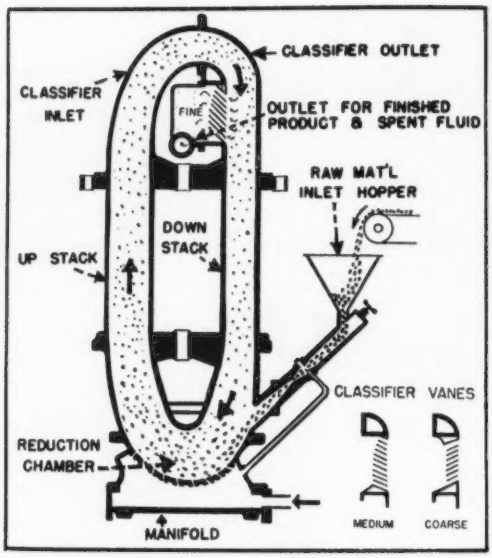
Important feature of the "Hi-Speed Prospector" core drill is the two-speed transmission. It permits the operator to shift into low gear when drilling broken or hard formation, thus reducing speed but still using the full power of the duplex air motor. Slowing other model drills for tough drilling is done by throttling the air motor which reduces power when it is most needed.

"Hi-Speed Prospector" weighs 275 lb. complete; it is easily handled by two men. The drill can be broken down into three units, the heaviest of which weighs 152 lbs. It can be mounted on a mine column, cross bar or side arm.

Capacity is 500 ft. of 1½-in. hole (core ⅞ in.) or 400 ft. 1⅞-in. hole (core 1⅛ in.). The duplex air motor develops 9 hp. Swivel or drilling head may be rotated for drilling at any angle. Feed gear selections to suit particular needs can be had.

This model is adapted for exploratory work underground, but can be used to drill blast holes rapidly at low cost.

Available: E. J. Longyear Co., Minneapolis, Minn.



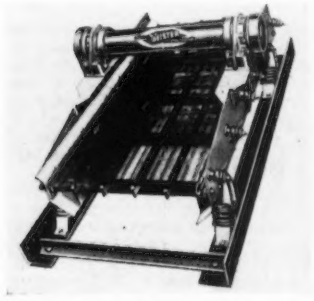
Fluid Energy Mill Has No Moving Parts (3)

Any elastic fluid such as air, steam or gases can be used by the Fluid Energy Mill to reduce minus 4 mesh particles to low and sub-micron sizes.

Feed is carried from the hopper into the reduction chamber by means of an injector. Fluid under pressure of from 75 to 200 psi. is discharged through nozzles from the manifold at sonic and supersonic velocities. This circulating fluid entrains the feed. Violent jet action breaks up the particles by impact and abrasion against each other. As the particles are carried up the stack into the classifier inlet, centrifugal force shifts larger, heavier particles toward the outer periphery.

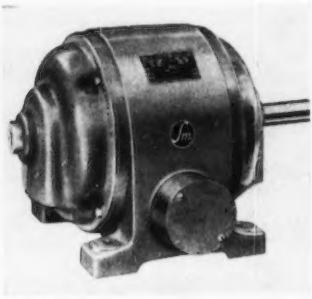
At the classifier outlet, part of the circulating fluid changes direction and flows through the classifier vanes out of the mill. With it flows material fine enough to be diverted from its path by the drag of the fluid. The larger particles continue down the stack and re-enter the chamber for further reduction. Severity of separation is determined by the pitch of the classifier vanes.

Available: C. H. Wheeler Mfg. Co., Philadelphia, Pa.



VIBRATING SCREEN for use with extreme fines features unitized head motion, longer, graduated stroke. Deister Machine Co., Fort Wayne. (4)

WORKING MODEL of jaw crusher intrigued movie starlet Lois Conklin at recent equipment displays says Pioneer Engineering Works. (5)



SPLASH-PROOF electric motor is for locations subject to direct streams of water or other liquids. Sterling Electric Motors, Inc., Los Angeles. (6)

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

SHUTTLE CAR OPERATION. "A Report on Mine Shuttle Car Operation" is based on 95 time studies. The 12-page bulletin dealing with advantages of powering shuttle cars with storage batteries, is put out by **Gould Storage Battery Corp.**, Trenton, N. J. (71)

PLANT INSTALLATIONS. **Condenser Service & Engineering Co., Inc.**, has announced five new catalogs, Steam Condensers, Steam Jet Air Ejectors, Oil and Water Coolers, Packaged Power Boilers, Centrifugal and Piston Pumps. (72)

CLAMPS. Bulletin published by **Hunter Spring Co.**, Lansdale, Pa., describes "Neg'ator" clamps an elastic member that exhibits negative or constant force deflection characteristics. (73)

BLADELESS PUMP. This 15-page job furnishes construction and operating details on a bladeless trash pump recently announced by **Fairbanks, Morse & Co.**, Chicago, Ill. (74)

SPEED CONTROL. How to get more out of your electric motors through speed control is the theme of four bulletins (GEA-5334-5337) just released by **General Electric Co.** Types of control, application, ratio of change and regulation are discussed. (75)

CONCRETE FLOORS. This 36-page illustrated booklet, "The Masterplate Iron-Clad Concrete Floor," gives full information on the nine features most important in industrial, commercial and institutional floors. **Master Builders Co.**, Cleveland, Ohio, put out this fine job. (76)

SECTIONAL CONVEYOR. Bulletin announced by Robins Conveyors Div., of **Hewitt-Robins Inc.**, gives an illustrated description of the company's sectional conveyor. Units are easily assembled to conveyor of any length in the field. (77)

SPEED REDUCERS. Booklet contains complete description of standard IMO-De Laval horizontal worm gear speed reducers, with specifications. Bulletin G-WB is put out by **De Leval Steam Turbine Co.**, Trenton, N. J. (78)

MACHINE REPLACEMENT. How do you decide when a machine should be replaced in your mine or plant? "MAPI Replacement Manual," published by **Machinery and Allied Products Institute** offers a formula to solve the problem with instructions for its practical application. Three years' research lies behind the 75-page booklet. (79)

COMBUSTION SAFEGUARD. This explanatory folder on the new "Flameotrol" combustion safeguard for oil and gas fired furnaces, boilers, kilns and other heating equipment, has just been released by **Wheelco Instruments Co., Chicago, Ill.** (80)

MATERIALS HANDLING. Materials handling manual that offers 355 ways to cut inventories has been prepared by **Aerol Co., Inc.**, Burbank, Calif. (81)

SHAKING CONVEYOR. Folder gives lots of information on the Jeffery MV conveyor. Circle 82 on the convenient card below to get further information from **Jeffrey Mfg. Co.**, Columbus 16, Ohio. (82)

VACUUM FILTRATION. If you're looking for some dope on continuous rotary vacuum filtration in general and FEinc equipment in particular, you will be interested in this 24-page bulletin just released by **Filtration Engineers, Inc.**, Newark, N. J. (83)

SAFETY PROGAM. "How to Set Up and Conduct a Safety B Program," a booklet issued by **American Optical Co.**, Southbridge, Mass., will be useful to companies planning to expand their programs for eye safety. (84)

CRUSHER. **New Holland Mfg. Co.**, Mountville, Pa., has issued a bulletin describing their line of crushers and how they work. Included are specifications, details of operations and numerous applications. (85)

TRANSMISSION BELTING. Four-page catalog section on its rubber transmission belting has been issued by **B. F. Goodrich Co.**, Akron, Ohio. Recommended uses are listed and specifications given (86)

POWER SHOVELS. Three new bulletins describing the Marion types 151-M, 4161 and 111-M Ward Leonard electric machines, have been announced by **Marion Power Shovel Co.**, Marion, Ohio. Described are special features, applications and specifications. (87)

PHOTOGRAMMETRY. "Air Speeds to your Map Needs" is a colorful little brochure to tell you exactly what engineering services **Jack Ammann Photogrammetric Engineers** renders. Included are topographic maps, aids to choosing a plant site, geologic surveys, drainage studies, tax maps and others. (88)

DIESEL ENGINES. "Diesel Engines —Fuels and Lubricants" is a valuable reference for anyone concerned with diesel motors. This interesting brochure published by **Sinclair Refining Co.**, New York, offers an easy-to-read theoretical and practical discussion. (89)

FURNACE PRESSURE CONTROL. To show how furnace pressure control equipment is reported to be raising combustion efficiency, refractory life, and product quality, **Leeds & Northrup Co.**, Philadelphia, Pa., has just published a completely illustrated revised edition of its 12-page catalog, "Furnace Pressure Control." (90)

SPRINGS. Catalog gives all pertinent facts on the line of springs made by **Morris Springs Ltd.**, Wolverhampton, England. (91)

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to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

March, 1950

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	8	15	31	38	45	71	78	85
2	9	16	32	39	46	72	79	86
3	10	17	33	40	47	73	80	87
4	11	18	34	41	48	74	81	88
5	12	19	35	42	49	75	82	89
6	13	20	36	43	50	76	83	90
7	14		37	44		77	84	91

My Name _____ Position _____

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SPEARHEADING Federal Motor Truck Co.'s huge new sales campaign will be Carl Loud (seated) general sales manager, and (left to right) Lewis I. Seaver, advertising director, and assistant general sales managers H. J. Hamernik (central zone), A. R. Winberg (western zone) and W. L. Hayes (eastern zone).

Memos from the Manufacturers

Controlling interest in **Ottumwa Iron Works** has been acquired by **Lou Mervis**, present head of **Pittsburgh Gear Co.**

New staff assistants in **General Electric Co.'s** Apparatus Department are **P. L. Alger, Marshall Anderson, T. M. Linville, C. H. Ridgley,** and **F. P. Wilson, Jr. J. Russell Watt** has been appointed sales manager of industrial laminates and insulating materials for the company's Chemical Department.

Vernon F. Daughney has joined the staff of the Mineral Dressing Laboratory of **American Cyanamid Co.**

Paul C. Wilmore has been named regional manager of **Reynolds Metals Co.**, Building Products Div., in the 11 western states.

Don K. Lambert is now manager of distributor sales for the **Falk Corp.**

H. C. Atwater has been promoted to district sales manager of the New York territory of **Industrial Brownhoist Corp.**

Worthington Pump and Machinery Corp. has appointed **Harry E. Lewis** as assistant comptroller.

American Brake Shoe Co. has opened a new sales office in Houston, Texas.

William B. Moore, Jr., has joined **Reynolds Metals Co.** as a technical service engineer.

C. M. Donahue will be the manager of **Mine Safety Appliance Co.'s** newly formed International Div.

Allis-Chalmers has done some reshuffling in general machinery district office personnel. **A. B. Frost** will manage the Boston office, while **J. E. Smet** takes his place as manager of the New Haven office. **G. G. Fintak** has been transferred to the Boston district. **G. H. Hoffman** has been named manager of the Birmingham office and **H. C. Sells** is the new manager in Knoxville.

Elastic Stop Nut Corp. of America has appointed **Robert F. Fettig** district manager of the Detroit and Michigan sales areas.

Rivett Lathe & Grinder, Inc., has purchased the entire line of air and hydraulic valves, cylinders and hydraulic power units from **Gerotor May Corp.**

The Institution of Mining and Metallurgy (England) plans a conference on wire rope this summer.

Roland J. Berkol has joined **Atlas Steels, Ltd.** (Ontario).

Carl F. Norberg has been promoted to executive vice president of **Electric Storage Battery Co.**

Hyster Co. has appointed three new district managers. **Donald R. Shaffer** will cover southeastern Canada, eastern Michigan, Ohio and New York. **John F. Wright** will cover the western area of the continent from Alaska to Oregon. **Karl T. Barr** will direct sales in Hawaii, California, Arizona, Nevada and Utah.

Electric Railway Improvement Co. has changed its name to **Erico Products, Inc.**

C. J. Marlett has been transferred from **Kennametal Inc.'s** Chicago office to the engineering department.

Through an agreement with **Clayburn Co., Ltd., Laclede-Christy Co.** refractory products will now be available to users in the Pacific Northwest.

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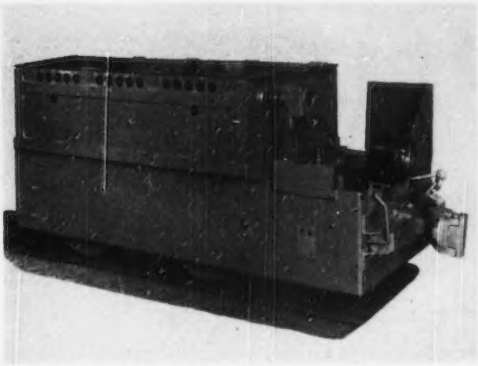
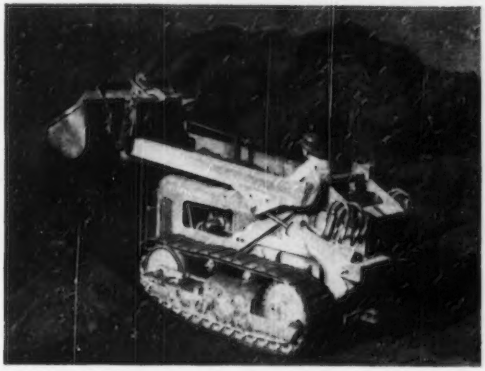
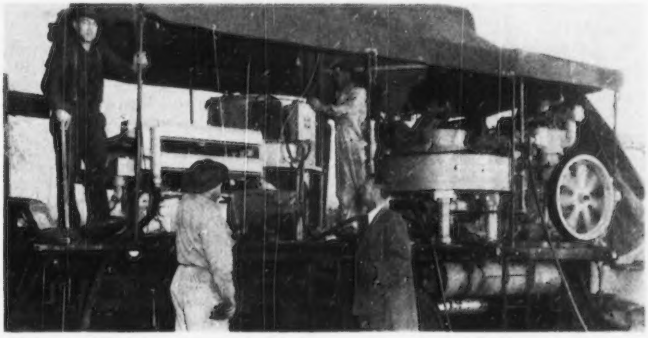


BATTERY LOCOMOTIVE for narrow gage service has an over-all height of only 42½ in. Uses totally enclosed spur gear drive with brakes mounted on armature shaft of motor. Atlas Car & Mfg. Co., Cleveland, Ohio. (7)

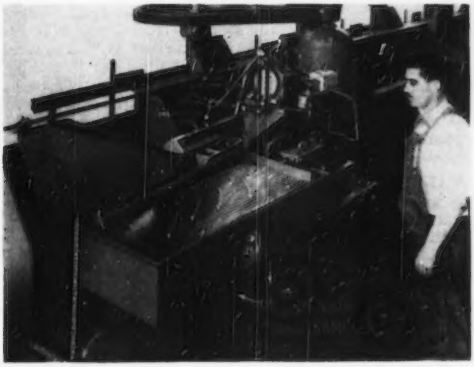


DOZER-LOADER features hydraulic bucket control for precision loading and dumping, faster cycles. Bucket capacities are ¾ and 1 cu. yd. Mechanical control available. Bucyrus-Erie Co., Milwaukee, Wis. (8)

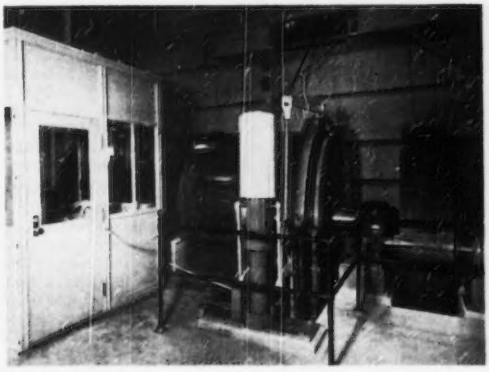


PORTABLE MILL, mounted on 3½-ton truck, has complete facilities for processing ore. Equipment includes concentrating table, rock crusher, conveyor, hopper, rotary pulverizer and gas-operated electric generator. Entire plant uses 27 hp., weighs 6 tons. Inventor Edward F. McTarnahan, Seattle, claims the unit can operate profitably on $4 and $6 ores. (9)

CHOPPING BIT with cemented carbide cutting edge recovers ore samples in large chunks. Cost of 2⅞-in. bit is $19.50 (lots of 10). Available: Kennametal, Inc., Latrobe, Pa. (10)

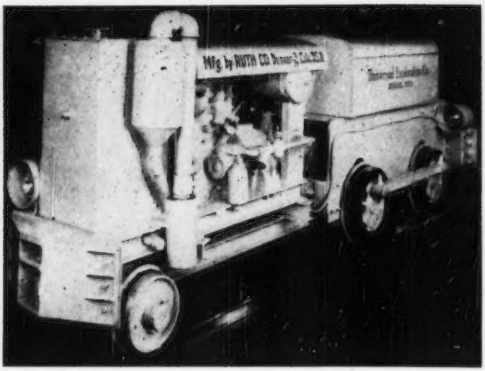


VISUAL SAMPLER permits flowsheet changes before necessity is revealed by assays. Unit can be mounted at any point in circuit. Comes in 2 sizes, 40 x 18 in. and 50 x 24 in. Denver Equipment Co., Denver, Colo. (11)



HOIST at Potash Company of America, New Mexico, is fully automatic. Hoisting is done in balance from 1,150 ft. using a skip-cage of 12,000 lb., hoisting 16,000 lb. of ore. Drum is 10 ft. dia. Nordberg Mfg. Co., Milwaukee. (12)

DUMPTOR combines power of a tractor with hauling speed of a truck over steep grades. All-welded, ribbed body has 6-cu. yd. capacity. Unit never turns on shuttle hauls and dumps in 1 sec. Koehring Co., Milwaukee. (13)



EXHAUST GAS CONDITIONER cools diesel locomotive exhaust from 1,200 to 122 deg. F., and removes irritants. Neutralizes all acid gases except carbonic. Ruth Co., Denver, Colo. (14)

Equipment Shorts

SEALING COMPOUND. Silicone dielectric compound provides chemically stable, waterproof sealing compound for ignition systems and electronic equipment. Adheres to metallic and non-metallic surfaces. Can be used to waterproof underground electrical installations where high humidity prevails in the mine. Available 8-oz. tubes, 1, 5 and 10 gal. **General Electric Co.**, Pittsfield, Mass. (31)

SLUDGE PREVENTION. Simple kit enables any workman to test acidity of transformer oil, in five minutes. Test clearly indicates when oil has reached the sludge-forming stage. Price: $25.00 Available: **The Gerin Corp.**, Red Bank, N. J. (32)

DUST FILTER. By providing frequent blasts of reverse air, the Sly Dynaclone eliminates shaking of cloth bags, prevents a building up of a dust layer on the bag wall, and makes shutdowns to remove accumulated dust unnecessary. Reverse blasts require no auxiliary equipment. Available: **W. W. Sly Mfg. Co.**, Cleveland, Ohio. (33)

BATTERY. Sub-zero weather is no problem for the 21-plate Rebat 2H Cold Starting Battery. It is designed for starting heavy motorized equipment at temperatures as low as minus 40 deg. Available: **Reading Batteries, Inc.**, Reading, Pa. (34)

"DASQUIK." This chemical when mixed with fresh Portland cement provides a mortar that will set up in 30 sec. It sets so quickly that it will stop a leak under as high as 40-psi. pressure. Available: **Dasco Co., Inc.**, Baltimore, Md. (35)

CARBURETOR CLEANER. Your carburetor doesn't have to be dismantled to be thoroughly cleaned out in less than 15 min. with the "Gumouter." Gadget provides for flushing out with a 50-50 mixture of cleaning solvent, "Gumout," and gasoline. Cleaning of the functional surfaces, venturi, jets and needle valve is said to be as effective as dismantling and manual immersion. **Pennsylvania Refining Co.**, Cleveland, Ohio. (36)

ALEMITE CAPS. Elastoplastic Caps are designed to fit over ⅜-in. Alemite Dot fittings to prevent dirt and other matter from lodging on the tip. Easily applied and removed, they hold by friction fit. **S. S. White Dental Mfg. Co.**, New York, N. Y. (37)

PENETRATING OIL. Fast-acting, lubricant-base penetrating oil, Ensign 318 Pen-a-trate, frees rusted or "frozen" metal parts. It is not a solvent and contains no kerosene. Available in 5, 15, 30 and 55-gal. quantities: **Ensign Products Co.**, Cleveland, Ohio. (38)

NON-LUBRICATED VALVE. Non-lubricated cylindrical plug industrial control valve employs a permanent seal at the plug stem, sealing packing at the base of the plug, a fixed load spring and a closer dimension tolerance and micro finish on the plug and body bore. Available: **Minneapolis-Honeywell Regulator Co.**, Minneapolis, Minn. (39)

STEEL HARDENING COMPOUND. "Hard-N-Deep" is a powdered chromium-carbide material that is said to provide tough uniform case hardening of steel in a short time at relatively low temperatures. Application is simple and only standard shop equipment is needed. Available in 1, 3, 5 and 10-lb. cans and in 25, 50 and 100-lb. drums: **Miracaloy Corp.**, New York 4, N. Y. (40)

CHAIN OILER. Solenoid-operated oiler assures positive lubrication whenever the chain is running. Its use on your conveyor chain will save labor, avoid excess lubricant, keep floors clean, and keep chain in good shape. Available: **Oil-Rite Corp.**, Milwaukee, Wis. (41)

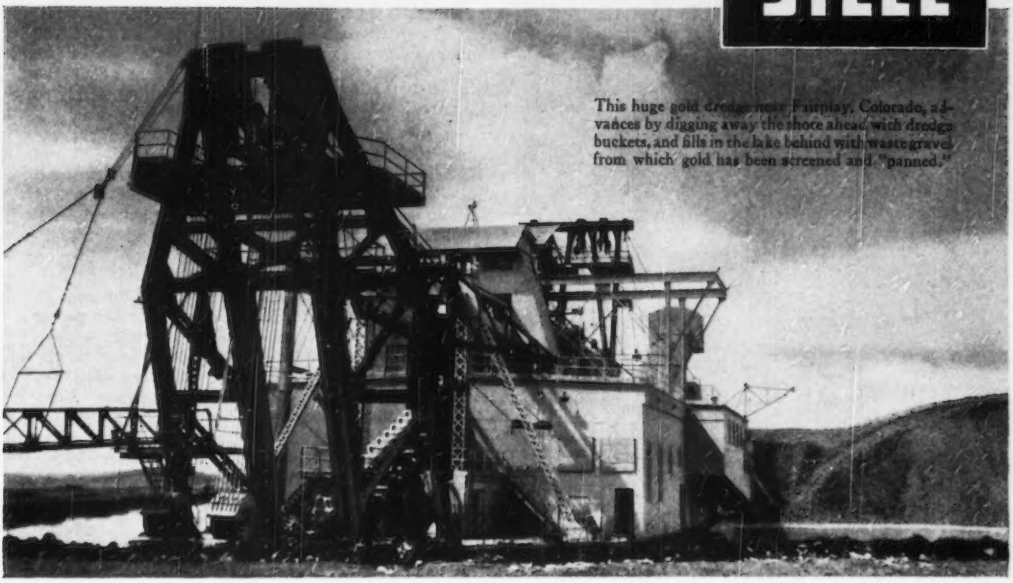
MOLYBDENUM LUBRICANT. Molybdenum lubrication is now ready for use in any conventional lubricating system. Trade named "Liqui-Moly" it is practically indestructible at high temperatures. Its tendency to "plate" itself to friction surfaces gives a friction supporting film which cannot be squeezed out. The manufacturer claims that in recent tests ordinary oils permitted friction surfaces to heat up from 300% to 504% faster than "Liqui-Moly." Available for experimental purposes in sample quantities at $2.00 per pound: **Lockrey Co.**, College Point, N. Y. (42)

HANDY POWER HAMMER. "Hamer-Dril" is an adapter which converts the rotation of an ordinary drill into hammer blows on a blow per revolution basis. It's 8½ in. long, weighs less than 3 lb. and can be chucked in any ¼-in. electric drill. Price $22.50. Available: **Hamer-Dril Co.**, New York, N. Y. (43)

CHEMICAL FEEDER. Automatic, self-draining "Hydroblender" introduces chemicals into the pipe line that will wet water at the point of use. Principal applications are in industrial dust control, blending, mixing and washing. Pressures up to 100 psi. can be safely handled. Available: **Aquadyne Corp.**, New York, N. Y. (44)

4 miles of J&L WIRE ROPE
is used to operate
MILLION-DOLLAR Gold Dredge

J&L STEEL



This huge gold dredge near Fairplay, Colorado, advances by digging away the shore ahead with dredge buckets, and fills in the lake behind with waste gravel from which gold has been screened and "panned."

South Platte Dredging Company gets longer life and greater economy from J&L Wire Rope

More than 4 miles of J&L wire rope is used to operate the $1,000,000 gold dredging boat, illustrated above.

Wire rope raises and lowers the "ladder" of dredge buckets. Others operate the "stackers" that dispose of waste gravel. The boat moves forward by wire rope, and is rotated by wire rope.

Wire rope operates the 45-ton "spud" or anchor on which the boat pivots. This spud, driven into the bottom of the 70-foot lake, supports the boat while dredging. Still more wire rope is used for auxiliary winches.

South Platte Dredging Co., operator of this "Goliath", near Fairplay, Colorado, reports that by comparison, J&L Wire Rope is more dependable, gives longer service life and is more economical.

During winter operations sections of frozen bank, when undercut, drop onto the "ladder" causing sudden strains on the wire ropes . . . or falling into the lake, rock the boat and put extra strain on bow lines and guys.

Operating conditions are made still worse because the wire rope must *operate with no external lubrication*. Any grease or lubricant in the water would lessen the recovery of gold.

J&L wire rope lasts longer under such conditions, because it is *Precisionbilt* with quality-controlled steel. Wires, drawn with uniform precision, are fitted together accurately to provide the longest possible wear.

Our new handbook, "Wire Rope Is a Machine", tells how to operate and maintain wire rope for maximum service. It is written *for the man on the job.* If you use wire rope, you'll want a copy. Return the coupon today!

Jones & Laughlin Steel Corporation
412 Jones & Laughlin Building
Pittsburgh 19, Pa.

Please send me a free copy of your new handbook, "Wire Rope Is a Machine."

Name_____

Company_____

Address_____

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L *manufactures a full line of carbon steel products, as well as certain products in* OTISCOLOY *and* JALLOY (*hi-tensile steels*).

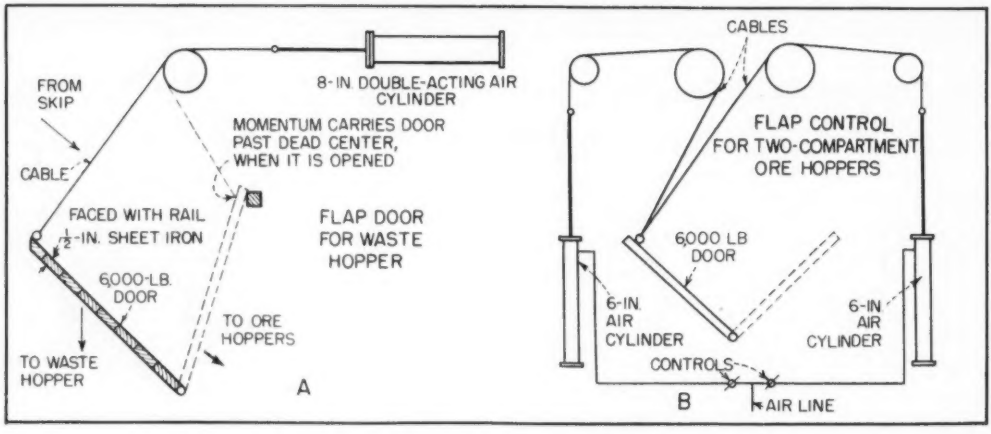
PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

OPERATING IDEAS

Welding Reclaims Drill Hammers

Worn rock drill hammers are reclaimed for re-use at a large lead property by oxy-acetylene welding, at a cost which averaged about 20% that of a new hammer. First all defective or battered metal is ground off the hammer. Care is taken to prevent overheating of the hammer because this will affect the performance of the rebuilt hammer. The hammer is then heated slowly to welding temperature, and if any checks or cracks appear at this time, more grinding is done. Next the hammer is built up with Oxweld No. 6 CM steel rod while being held in a 45-deg. position as shown. All metal added is thoroughly fused. After the hammer is welded it is cooled in lime, ground to length, properly shaped, and polished before being heat-treated.

In heat-treating, the end of the hammer is heated to 1,550 deg. F. in a thermostatically-controlled furnace. The piston is also heated to about 1,100 deg. F. to prevent the hammer from breaking near the piston when it is quenched. The heated hammer is then quenched in water for 1 sec. The remainder of the quenching is done in a thin heat-treating oil. Finished hammers are tested for hardness before re-use. Illustration and above information pertaining to the rebuilding and heat treatment of rock-drill hammers presented through courtesy of Linde Air Products Corp., New York 18, N. Y.



Flap Doors for Diverting Feed to Bins

Two types of flap doors for diverting the flow of ore and waste into bins are illustrated above by Robert Reynolds, of the Calumet and Hecla operations near Shullsburg, Wis.

Type A is used to deflect waste discharged from mine skips into a waste hopper. Normally ore passes over a 6,000-lb. door into ore hoppers. The door is jerked up from its normal position by a double-acting cylinder with sufficient momentum to carry it beyond dead center. A second jerk will restore the door to its original position.

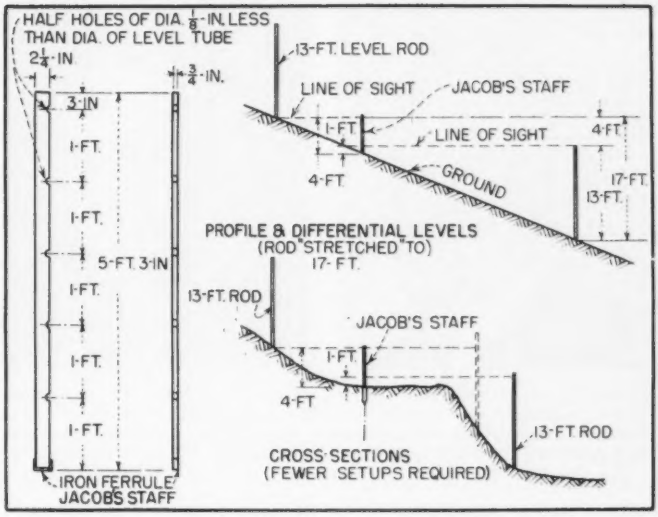
Type B works in a similar manner, except that two air cylinders are used as shown schematically above. Instead of jerking the door beyond dead center, the air cylinders are used alternately to pull the door to one side of dead center or the other.

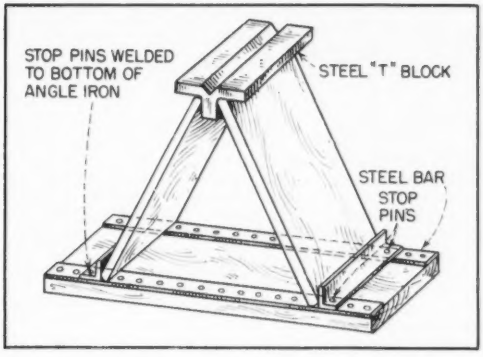
Jacob's Staff Speeds Hand Level Work

Lucien Eaton, Jr., of Badin, N. C., illustrates and describes this Jacob's staff which will prove useful for hand level operators. If the surveyor holds his hand level in any of the semi-circular notches placed at even foot marks, he automatically knows his H.I.

Note in the two examples illustrated that fewer setups are needed if the hand level is placed in one notch for a backsight and in a higher notch for the foresight. In effect, the 13-ft. level rod is "stretched" from 13 to 17 ft.

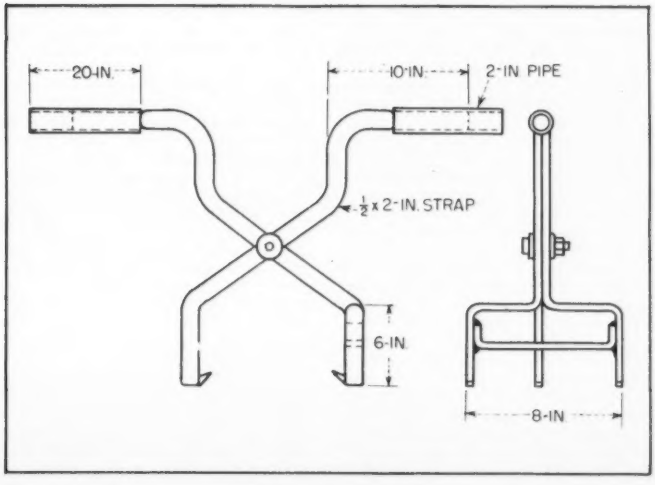
Construction of the ¾x2¼-in. rod footed with an iron ferrule should present no serious problem to anyone familiar with simple hand tools.





Adjustable Work Support

The simple work support or carpenter's horse shown will be found very useful at mine, mill and smelter repair shops as temporary rests for much of the material and equipment that undergoes repair. It is simple in construction and can easily be made at low cost. A hardwood plank forms the base of the support. Upon it and along the sides are fastened two flat steel bars drilled at desired spacings for the insertion of the pins at the bottom of the angle-iron stops. These stops support two lengths of plank which come together at the top to hold a steel "T" block. The support can be adjusted for various heights by simply changing the distance between the two stops. When not in use, the supports can be dismantled to occupy very little space.



Tongs for Handling Track Ties

These tongs will simplify the handling of mine track ties. They are constructed of steel strap iron and two short lengths of 2-in. pipe. The tongs have three prongs, two of which grip the tie on one side, and a third on the opposite. The wood is gripped firmly by stub points which do not enter far enough to pass through the treated zone. The tongs offer these advantages:

1. Workmen are spared sore eyes and skin irritation which may be caused by handling creosote-treated timber.

2. The three-pronged design enables track workers to balance the ties easily.

FRANCIS H. BROWNELL, former AS&R chairman, was awarded the Charles F. Rand medal for outstanding efforts in the non-ferrous field.

FRANCIS C. FRARY, Aluminum Company of America, received the Douglas Medal for distinguished contribution in field of aluminum.

WILLIAM E. WRATHER, U. S. Geological Survey, won the Lucas medal for achievement and leadership in petroleum geology.

Economics and Research Are Key Topics At 1950 AIME Meeting

"INCENTIVES," "subsidies," "ECA" and "depletion" seemed to be on almost everybody's mind at the 1950 meeting of the AIME in New York. Attendance at the economic sessions and conversations in halls and lobbies pointed up the deep-felt concern of the mining fraternity over the current economic situation, both internally and internationally. All branches of the industry faced the same problem: What can we do to brighten the future of mining?

Research—who should do it and how much of it—cropped up time and again in the technical sessions. It was generally agreed that research was becoming increasingly necessary for profitable operation. But one group, mostly operating men, felt that projects should be confined to the immediate problems facing the mine. Opponents said that research for knowledge's sake would pay dividends over the long haul.

High points in the over-all program were the Welcoming Lunch and, as usual, the Annual Banquet.

An overflow crowd was on hand in the main ballroom of the Hotel Statler to hear General Dwight D. Eisenhower, President of Columbia University, speak on the virtues of free enterprise and the importance of adhering to the principles that made America great.

"Our doing good may finally result in doing more harm than perhaps we could do in any other way," he said in commenting on the welfare state.

Congressman Christian A. Herter (R., Mass.) spoke briefly on plans for developing a climate in which American investors could operate abroad.

Donald H. McLaughlin, president of the Institute, in addressing the huge gathering at the annual banquet, pointed a critical finger at the overemphasis of the philosophy of security. "Anyone who feels that the time of opportunities for brilliant new achievements has passed in our fields is blind," he said.

He went on to state that we have literally only scratched the very surface of the earth in our quest for minerals.

L. E. Young, retired AIME president, made the following medal awards for 1950:

To **Francis H. Brownell**, American Smelting and Refining Co., the Charles F. Rand medal for outstanding efforts in the non-ferrous field.

To **Francis C. Frary**, Aluminum Company of America, the James Douglas medal for distinguished contribution in the field of aluminum.

To **Howard N. Eavenson**, consulting engineer, the William Lawrence Saunders medal for leadership in coal mining industry.

To **William E. Wrather**, U. S. Geological Survey, the Anthony F. Lucas medal for achievement and leadership in petroleum geology.

To **Paul Weir**, the Erskine Ramsay medal for outstanding work in coal mechanization.

To **Walter R. Hibbard, Jr.**, the Robert W. Raymond Memorial award for his paper on "Plastic Deformation for Large Grained Copper Specimens."

To **Arthur F. Taggart**, the Robert H. Richards award for outstanding contributions to progress in mineral beneficiation.

To **John S. Marsh**, Bethlehem Steel Corp., the Robert W. Hunt award for his paper, "Operation of Oxygen-Enriched Open Hearth Furnaces."

To **Morris Cohen** and **William Harris**, the Institute of Metals Division award for their paper, "Stabilization of Austensite Martensite Transformation."

The presentation of some 290 papers at 70 technical sessions makes it difficult to report in detail on all the programs, but a brief summary of various divisions follows.

Mineral Economics

The mineral Economics Division held two interesting sessions on "Foreign Enterprise for the American Mineral Industry" and "Incentives for American Mining."

On the first program, C. H. Burgess, Strategic Materials Division, ECA, gave a lucid account of ECA's activities in helping build the strategic stockpile and supply deficient materials to Europe by expanding production. Mr. Burgess pointed out the considerable tonnages of minerals and mineral products which ECA has taken off the domestic market in the last two years.

Geo. A. Lamb, Pittsburgh Cons. Coal Co., discussed "Coal in the World Energy Pattern," analyzing the vital part coal plays in world economy. John R. Lotz, Stone and Webster, outlined the difficulties in setting up

a seven-year industrial program in Iran.

Congressman Christian A. Herter gave an excellent talk on Point IV, the Administration program for giving technical assistance and financial help to undeveloped countries. He viewed the program as having great political promise, although recognizing much difficulty and delay.

On the incentives program, Donald B. Gillies, Republic Steel Co., took a strong position for free enterprise and tax relief and against the welfare state and subsidies to domestic mines. Ira B. Joralemon, consulting geologist, described small mining as nearly extinct, chiefly because of burdensome taxes, and espoused Government payments for exploration and derelict properties. H. A. Stewart, Department of Interior, took a similar position to Mr. Gillies for the oil industry. Granville S. Borden, mining attorney, gave a stirring talk on the unfairness of the Presidential attack on depletion allowances, citing twelve fundamentals about the mineral industry that every legislator ought to know. V. C. Wansbrough, Canadian Metal Mining Association, described the Canadian system of mine taxation, pointing out that it incorporates the recommendations which the National Minerals Advisory Council has made to the U. S. Government.

Milling

The milling sessions were highlighted by a symposium on mill management. Brought very close to the surface in this session was the mill man's conviction that his own top management thinks the mill is the easiest part of the operation to run. At least most mill men will tell you privately that top executives seem to be selected oftener from the mine staff than the mill. There's food for a dozen symposiums here.

Professor Gaudin reported on a new technique that he feels will outmode the captive bubble test for floatability. It involves use of a vacuum to supply the aeration in the pulp under test. He also reported on progress of work with radioactive tracer atoms, principally in flotation of quartz. The American Cyanamid Co. is also using tracers to check on the action of their dithiophosphate reagents.

Jack Myers showed a movie of the inside of his big new Tricone ball mill. It backed up his statement that the balls in this mill simply roll and do not cascade. Apparently the ball charge acts as a kind of fluid mass that churns in a pool along the shell of the mill.

Mesh-tons doesn't impress Jack as a basis for rating mill performance. In one flowsheet, by sending rod mill discharge to the classifier first, then putting the sands into Tricone, Jack gets the best mesh-tons rating. But by putting the rod mill discharge into the Tricone first, Jack gets the best metallurgical results. This, he contends, is where the pay-off is, and not a sterile mesh-tons rating. It would seem that this is a question to be answered by operators as individuals; there can be no rigid principle applied.

Among the savings garnered by the huge new Tricone at Tennessee Copper are: 19% in power, 28% in xanthate used, 29% in copper sulphate, and 33% in flotation time. It adds up so far to about a 10c. per ton over-all saving.

Discussion of automatic controls included a fine exposition of the philosophy of the science by Norman Weiss. He feels that automatic controls can easily be misapplied, and that their purpose is not to replace human skill but to extend and supplement it.

Carl Marquardt reported on his density meter, which has operated so successfully at Pioche and Bauer. All one can say is that it works and the operators like it. A similar reaction was reported for Massco's Circuitron, a grinding circuit electronic control developed at Telluride Mines in Colorado by Adams of Mine & Smelter Supply.

The steadily-growing Minerals Beneficiation Division honored Arthur Taggart at a luncheon as the first recipient of the MBD's Richards Award. The award is a beautiful, but strictly non-utilitarian, silver vanning plaque, given each year in recognition of service to milling. Ted Counselman, Herb Rose and Jack Myers also received, from Doctor Don Scott, special degrees recognizing their leading roles in getting the Division established.

Mining

Herman Mutz, of International Nickel Co., whisked through a large number of slides which established a most convincing case for the value of mining research in cutting costs and improving mine efficiency.

Drilling efficiency and cost determinations require more basic data on the physical properties of rocks, according to W. B. Mather, of Southwest Research Institute. As a suggestion his paper, "Rock Hardness as a Factor in Drilling Problems," distinguished between abrasion, impact, and compression hardness as basic factors for research.

Gadgetry used to determine roof movement and conditions at the U. S. Bureau of Mines Oil-Shale Mines at Rifle, Colo., was described and demonstrated by H. L. Teichman, who was co-author of a paper by E. M. Sipprelle on the subject. Equipment used included microseismic devices, strain gages, and extensometers. The strain gage is so sensitive that pressures exerted by hand on a small specimen of the shale at the meeting registered distortion in micro-inches.

In a paper, "Ores and Mining in the Itabira Iron District, Brazil," by G. Whitehead and John V. N. Dorr II, it was reported that iron ore reserves for the district of 100 million tons of lump ore, 100 million tons of softer ore, and 500 million tons of lower-grade iron formation were not "over-optimistic."

Non-Ferrous Metallurgy

The growing importance of titanium and zirconium as industrial metals was reflected in the lively interest shown by metallurgists in all fields at the session devoted to the two relatively new metals. Across the board interest was also displayed in the symposium on dust collection. New wrinkles in the conventional approaches to the problem were discussed as well as some newer techniques such as utrasonic precipitation.

The zinc session was given over to a large extent to pioneering work presently going on. The lead session heard some lively discussion on lead blast furnaces when the Stewart furnace (inverted bosh) was broached following L. A. White's (Broken Hill Associated Smelters) paper, "Development of the Lead Blast Furnace at Port Pirie."

In general, a noteworthy development was the concern expressed in physical chemistry which resulted in the formation of a committee with Herbert H. Kellogg, Columbia University, as chairman, to handle the subject.

Geology

Harrison Schmitt, consulting geologist, suggested a new basis for the classification of ore deposits because present classification methods are inadequate. For tentative consideration, he suggested that they be classified as shallow and deep, with 5,000 ft. being a good division line. Next he proposed that they be cross-classified according to temperature under these rough sub-divisions: carbonate host rocks, siliceous host rocks, and magmatic host rocks. Using these two dimensions on a chart, he demonstrated that many known deposits would fit into this scheme of classification. In discussion, L. C. Graton was of the opinion that the present basis should be retained, and C. H. Behre, Jr., thought that temperature-pressure factors were more important than depth.

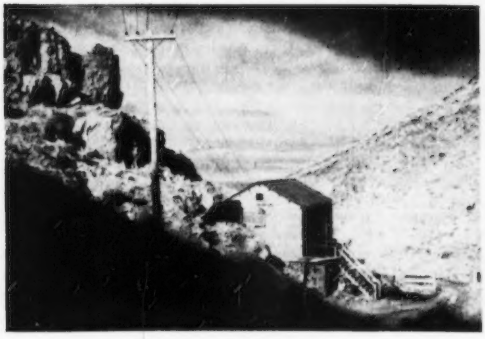
Edward Wisser presented an equally controversial paper in which he concluded that folded and thrusted bedded rocks produced by Tertiary upheaval may have been acted upon by vertical arch forces rather than tangential compressive forces as commonly supposed. He suggested that the skin of crustal upheavals may have moved away from the center of arches by plastic flow and produced deformation and thinning of beds now observable in Western areas of the United States.

MINERS at Sierra Magnesite mine drill a 20 x 65 x 7-ft. block 30 ft. above drift level in preparation for blasting.

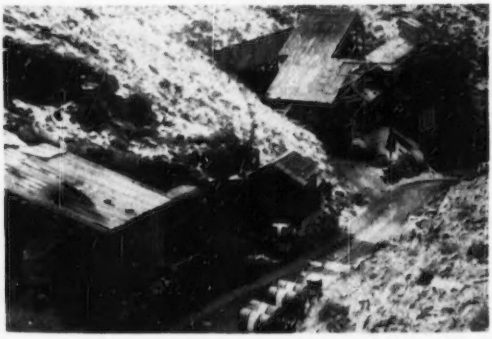
Operation Magnesite at Gabbs, Nevada

ROCKERSHOVEL at draw point, loads car which will haul ore to two air-operated underground vibratory feeders.

MINE SUPERINTENDENT H. J. Tillia talks things over with L. K. Marshall. Mine produces 80 tons of magnesite per hour.



SMALL SHED houses Caterpillar diesel-electric 94-kw. generator set which supplies power for conveyor belts, shaking screens in plant and for the mine and shop.



AIR for mining and plant is furnished by two Caterpillar-driven compressors. Pioneer crushing plant operates 4 hours per day, 26 days a month.

IN MINING

IN THE UNITED STATES

- Colorado Mining Association Holds Meeting—P. 116
- Floods Cut Fluorspar Production—P. 120
- New Company to Mine Carlsbad Potash—P. 122

ALASKA

★**Aluminum Corporation of America** has purchased land in the Dyea and Skagway area. A large aluminum plant is proposed for the Dyea acreage and administrative offices for Skagway. The company had geologists making studies of the mountains between Skagway and Lake Bennett, and after completion, land was purchased. Ralph Brown of Alaska's Development Board made known that the options had been taken up. Plans for a large hydroelectric power development in the area have been reported for some time.

★Two low-grade copper deposits in the Iliamma area were investgated last fall by John J. Mulligan and Robert S. Warfield, Bureau of Mines engineers. Investigation will continue this season before information will be released to the public. **St. Eugene Mining Co.**, subsidiary of Ventures, Ltd. of Canada, has had men in the district also. Other work of the U. S. Bureau of Mines included: drilling lead-zinc deposits on Kulu Island; drilling of limestone deposits near McKinley Pard; and studies of mining conditions in the Hyder district.

★**Alaska Iron Co.** of Seattle, has taken over 200 iron claims in the Klukwan area, according to Joseph Morgan, director of the Reclamation Bureau of Alaska. A. E. Schrimpf is president and Calvin H. Barkdall, vice president. It is reported that **Oliver Iron Co.** and **Fontana Iron Co.** made surveys in the district in 1949. The U. S. Bureau of Mines' Alaskan branch also investigated the deposits and will continue with the investigation this season.

★Howard Hayes and Stanwood P. Whiteley plan to build a mill, improve present buildings, and operate on a recovery basis the **Chichagof Mining Co.'s** property in the southeast part of the Territory.

★Reports from Ketchikan indicate production will be resumed early this season at the Rush-Brown and Salt Chuck mines at Kasaan Bay. Robert C. Byers of **Pewabik Mining Co., Ltd.** and A. L. Howard of **Alaska Gold Metals Co.** were at the properties late in 1949. It is said approximately one half million tons of milling ore has been blocked out.

★According to preliminary figures from the U. S. Bureau of Mines for 1949 production, the value of Alaska's mineral output was estimated at $11,355,000 compared with $13,028,000 in 1948. The gold production declined for the second consecutive year, estimated value being $7,731,605 against $8,693,825 in 1948. Production was 220,903 oz. Chief gold producer was **United States Smelting, Refining & Mining Co.** with five dredges in the Fairbanks district and two in the Nome area. Coal ranked second to gold in value of output. It was valued at $2,205,900, 21% less than the all-time high in 1948. Silver output was about half of 1948 production, lead declined one-fifth, but tin production although small, was considerably above the 1948 valuation.

ARIZONA

★Atomic ore production in the state has been pegged at 200 tons a day by Charles H. Dunning, director of the State Department of Mineral Resources. Each ton produces about 4 lb. of uranium oxide with a value of $3 to $3.50 a lb., he said. All operations are by the **Vanadium Corporation of America** and are being conducted on the Navajo Indian Reservation in northern Arizona. Of many discoveries reported during the past year, none are being privately operated.

★Big Pine manganese mine near Heber in Navajo County has been purchased by Joe Kelley, Phoenix, from John G. Patrick. Kelley plans to add $100,000 in heavy machinery and start operations as soon as snow conditions permit.

★Mining activity near Parker in Kingman County has increased, and several new properties are being worked. Gordon D. Paxson of Albany, Ore., has erected a 7-ton mill at the **Golden Ray Mine**, gold and copper workings. The Empire Mine, closed for a number of years, is being worked again on a small scale and is making regular gold and copper shipments.

★Pay contracts at **Phelps-Dodge Corp.** copper operations at Ajo, Douglas, Bisbee, Jerome, and Morenci were upped 40c. a day for 4,500 workers. The increase will be in effect until Nov. 11, 1951. Workers involved represent about 70% of the corporation's employees. The new scale for 37 local unions ranges from a low of $9.68 a day to $14.40.

ARKANSAS

★All four pot-lines of **Reynolds Metal Co.'s** Jones mill are slated to be in production in March. This will bring the mill into full-scale operation for the first time since the war. Plant capacity should be about 144,000,000 lb. of aluminum a year.

CALIFORNIA

★About 500 cars of pumice have been shipped by the **Superlite Corp.** from its Obsidian Butte deposit near Calipatria in Imperial County. All production to date has been transported to Phoenix, but current construction of a pumice-block plant at Calipatria by the company will allow local handling of the material. Plant capacity at the quarry is 50 tons per hour. Operations are under the direction of Morris Butterfield, Calipatria.

★The Rio Del Oro lode claim near Forest Hill in Placer County produced ore of moderate grade last year. Gold occurs there in gangue material composed principally of magnesite and is found along a contact of serpentine. C. W. Doherty and Edward Morrice, Jr., were operators.

★Sand and gravel is being produced on Bear River on the You Bet-Red Dog road near Colfax in Placer County. The gravel is principally tailings

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California *(Continued)*

from hydraulic mines formerly worked further upstream for gold. **Marshall & Miles Gravel Co.** is the operator.

★**Swartz & Mitchell** is operating a Judson-Pacific dry-land placer outfit, handling from 500 to 600 yd. daily, on gravel at the old Virginia mining camp near Newcastle.

★An access road is being built to the old French Bar gravel deposit on the Trinity River near Del Loma in Trinity County. The **Ora Del Loma Co.** was formed by B. T. Wilke and associates to work this deposit for gold with a slack-line cableway. The new operators have a 3-cu. yd. bucket which will travel on a 2-in. dia. wire cable over a 700-ft. span. M. L. Benoist of Weaverville is supervisor.

★Two nephrite jade lenses have been found on Lewis Hill near Porterville in Tulare County, and about a ton of material has been mined from one lens, with several more tons in sight. The jade is of medium to dark-green color, with excellent translucency and fine cutting quality. Frank Janolco and F. V. Alston, Porterville, operate the mine. The lens now opened appears to be a metamorphosed inclusion in a serpentine sill.

★**Utah Construction Co.**, San Francisco, has leased the Sunset Manganese property near Greenville in Plumas County, and is shipping manganese ore to the U. S. Steel Co. at Geneva. The company moved in heavy mining equipment in October, following a U. S. Bureau of Mines survey last year which showed existence of large bodies of low-grade ore.

★An organization to speak for American tungsten interests in Washington, D. C., was set up late in January at Fresno, Calif.

H. A. Savage, Fresno, was chosen manager of the organization, to be incorporated as the American Tungsten Association. One of the aims of the group will be to secure the cooperation of the U. S. Bureau of Mines in establishing a tungsten refining plant in the West.

★Dump ore is being milled by **Associated Metals** at its Pine Grove gold mine at the rate of a ton an hour. The company is reportedly considering underground mining at the property, credited with containing valuable ore deposits.

★**The State Division of Mines** has published a single volume, Bulletin 142, listing the mineral resources and production of the state's 58 counties. The publication also contains a resumé of the geology of each county and of the active and idle mineral deposits with their borders. A directory of mineral producers, a list of dealers, custom mills and commercial grinding plants, and lists of mineral buyers and testing laboratories are also included.

★**Redlite Aggregate Corp.** and **Volcanic Cinder Co.** have begun mining operations in one of the few commercially exploited deposits of volcanic ash on the Pacific coast.

Located in the desert above Los Angeles between Mojave and Lone Pine, some 11,000,000 tons of the red-violet cinders have been mapped. Cinders are mined from flats around the volcanic-hill cone by bulldozers.

COLORADO

★**Front Range Mines, Inc.**, has purchased and is remodeling the Clear Creek mill near Dumont, five miles west of Idaho Springs, for treatment of ore from the Strong and Mary Cashen mines in the Cripple Creek district, the Mattie mine in Clear Creek County, and the Melvina mine in Boulder County. Approximately 120 tons of dump and stockpile ore from the Mattie mine are being treated per day.

★Operations at the Uravan plant of the **U. S. Vanadium Corp.** have been resumed, following a rehabilitation program. A coal mine in the Nucla area started operations Jan. 1 on a contract basis, with a production of 3,000 tons per month for the Uravan plant.

★Extensive exploration drilling programs by the Government and private parties were underway in the Colorado Plateau area at the close of 1949. A significant increase in mining activities was noted in areas where drilling has been done. During the closing months of 1949, approximately 40 diamond drill rigs were operating in the field on either Government or private contracts, employing approximately 200 men. **Minerals Engineering Co.** of Grand Junction operates drills for an associated group of well known contractors in addition to its own rigs. The company drilling group comprising 26 rigs is the largest contractor in the field. It is completing about 30,000 ft. of drill holes monthly.

★**Bonita Mining Co.** has purchased the property of the Lead Carbonate Mining Co. near Silverton. This property was formerly operated by John and Fred Archibald and H. P. Ehrlinger. Mr. Ehrlinger has been retained as local manager of the new company. The Bonita Mining Co. has acquired additional property near the Lead Carbonate mine and mill at Gladstone, Colo., and other San Juan property.

★**R. O. Dulaney**, Fort Worth oil man and builder, says he now controls a group of uranium mines in southwestern Colorado from which is taken about 60% of the uranium produced

in the nation. Dulaney said he bought half of the uranium property last May and recently obtained an additional 25% from F. A. Sitton of Dove Creek, Colo.

★**Vanadium Corporation of America** advocates that a U. S. fund of $10 million be provided for the construction of a modern highway between Denver and Phoenix through the "four corners" area at the juncture of the borders of Colorado, Utah, New Mexico and Arizona. D. W. Viles, general manager of the firm, said that the proposed route through the Navajo Indian Reservation in Arizona would make a large area containing known uranium deposits easily accessible. Mr. Viles said that this area had sufficient uranium resources to make this nation independent of foreign supplies. Thus far, however, almost complete lack of transportation facilities in the area has made development of deposits very difficult or impossible. He cited as an example the Monument No. 2 uranium mine now being operated by V.C.A. just north of the proposed highway route. Here the ore is trucked 205 miles to the firm's processing plant at Durango. Grades of 18% over unimproved roads are common on the trip.

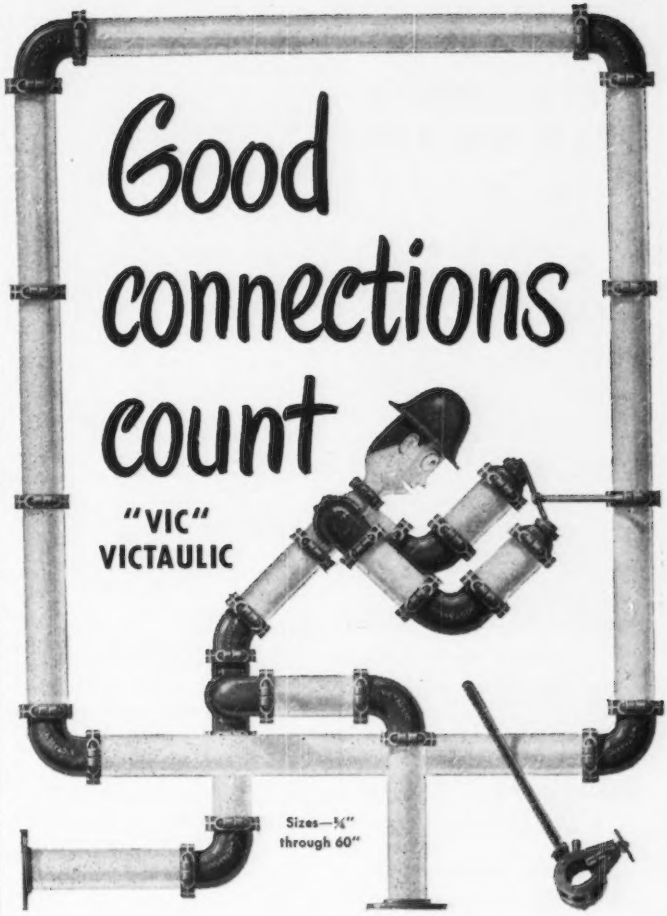
★**Consolidated Caribou Silver Mines, Inc.,** has completed registration with the SEC for the financing of its property near Boulder, Colo. The company is offering 800,000 shares at $1.25 a share. Approximately $760,000 will be spent this year on the property to develop silver and uranium ores.

★**Climax Molybdenum Co.** produced 10 million lb. of molybdenum and the following byproducts during 1949: 207,000 lb. of tungsten, 6,800 tons of pyrite, and 38,000 lb. of tin. Late in 1948, work started on a contract to drive a tunnel 300 ft. below the present workings to develop ore on that level. This contract entailed approximately 12,000 ft. of 12x14-ft. tunnel. It was completed Dec. 1, 1949. Operations at present are on a 5,000-ton-per-day basis. Approximately 500 men are in the company's employ.

★**Jones and Nylene Mining Co.,** lessors of the Garabaldi tunnel at the head of California Gulch near Leadville produced about 600 tons of ore per month during the past year. All ore was treated at the AS&R mill in Leadville.

★Considerable interest was shown in both technical and legislative problems tackled at the annual meeting of the Colorado Mining Association held in Denver, February 2-4.

Safety, strategic materials, taxation, public land policy and oil shale occupied the first day's agenda. James Bradley described the depressed state of antimony and tungsten operations. James Hoyle, Miles Romney and Evan Just discussed tax discouragement to new mining ventures and advocated tax incentives. In public land discussion the industry, as usual, did not



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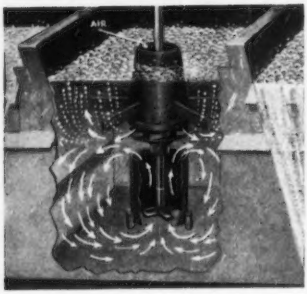

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Colorado *(Continued)*

see eye to eye with the Bureau of Land Management. Only an encouraging report on oil shale mining, treatment and economics kept the day from being completely dismal.

On the second day the gathering took up uranium mining, gold monetary policy and problems of mining. Phillip McKenna, Latrobe, Pa., gave a stirring plea for return to the gold standard at $35 per oz. He was opposed on the price aspect by Mr. Sears of California who insisted that the gold price should reflect the domestic cost of reduction.

Discussion of mining problems centered on the O'Mahoney bill. Felix Wormser demanded protection against dumping of foreign metals in U. S. markets, spurred on by devaluation.

On the third day, drilling and drill bits, cost cutting, geology and geophysics, and one-metallics received attention.

IDAHO

★**Lucky Friday Silver-Lead Mining Co.** reports that net smelter receipts for ores shipped during 1949 totaled $356,250. Except for development ore from the 1,600-ft. level, production has been from stopes on the 1,400 and 1,000-ft. levels.

★**Day Mines, Inc.** reports the discovery of a new vein of commercial grade silver-lead ore in the old Hercules mine at Burke. The new vein is located in the previously unexplored area on the 1,000-ft. level. Mill tests indicate that the ore averages 9% lead, 23% zinc, and 6 oz. silver per ton. Drifting operations will reveal the importance of the discovery.

★Glenn L. Fish, president of **Silverton Mines, Inc.**, northwest of Wallace, reports that the company has acquired the Cumberland mine near White Sulphur Springs, Mont., and has expended $41,110 since May 1, 1949, in reopening the property.

★**Polaris - Silver Summit Mining Co.** has completed a raise from the 3,200-ft. level to the 3,000-ft. level and is now preparing to open the vein on the 3,100-ft. level. The raise is all in ore according to L. E. Hanley, general manager.

★**Bradley Mining Co.'s** new $1.5-million antimony smelter at Stibnite, Idaho, is now in operation, treating antimony-gold ore from the company's Yellow Pine mine. The plant is designed to treat custom ore containing antimony, gold and silver.

★**Callahan Consolidated Mines, Inc.**, is developing a series of veins in the Silver Belt south of the Coeur d'Alene Mines property, working from the 2,800-ft. level in the latter property. The crosscut has now been extended 4,965 ft. of the estimated 6,000 ft. necessary.

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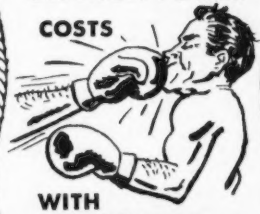

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★**Silver Syndicate Mining Co.**, half of which is owned by Sunshine Mining Co., reports that the mine is producing silver-lead ore from every available working face at the rate of about 4,000 tons per month. Work is confined to an area about 2,000 ft. long between the 3,500 and 3,100-ft. levels.

★J. V. Grismer of Wallace has been granted a patent on a new type of shaft mucking machine. A model of the machine has been built by the **Diamond Drill Contracting Co.**, of Spokane, and has been tested. One operator can run the unit designed to fit inside of shaft timbers. It has an 8-cu. ft. shovel operated by a hydraulic boom. The entire machine weighs 1 ton.

★**Sidney Mining Co.** has awarded a contract to Cy Cornet, of Kellogg, to sink the Sidney shaft an additional 300 ft. to the 1,200-ft. level. December production at the Sidney mine totaled 6,682 tons of ore, averaging 5.86% lead, 10.65% zinc, and 2.53 oz. silver per ton.

★**Sunshine Consolidated** reports a rich streak of ore in the raise being driven from the 3,100-ft. level to connect with a crosscut on the 2,700-ft. level. The raise is reported all in ore, but the 6-in. streak assayed 255 oz. per ton. The raise is up 130 ft. from the 3,100-ft. level.

★**Highland-Surprise Mining Co.** announces that the company is driving a crosscut from the 700-ft. level in Highland-Surprise to the adjoining Nevada-Stewart Co.'s property. The nearest possible Nevada-Stewart vein is 415 ft. distant.

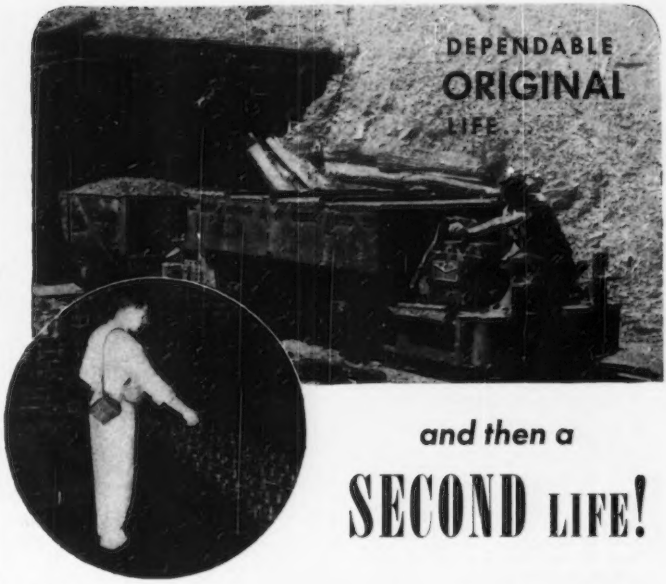
★**Hecla, Sullivan, Polaris and Silver Summit Mining** companies have wired Senator O'Mahoney as follows regarding the O'Mahoney mine incentive bill:

"We are opposed to production subsidies but approve reasonable exploration assistance limiting Government participation to approximately 50% of cost and eliminating overhead from costs."

L. J. Randall, tax accountant for Hecla wired, "It would appear to me that more lenient tax laws, in so far as the mining industry in general is concerned, would furnish a much greater inducement toward exploration and development of new orebodies than any subsidy which the Government might work out. Mining men in general are rather opposed to a direct subsidy from the Government and I think they should be commended for this stand."

Stanly A. Easton, president of Bunker Hill & Sullivan, in a letter to Senator O'Mahoney, said:

"I am opposed to subsidies per unit of domestic production which trend toward restoration of the premium price plan imposed for the purpose of increased lead production during the war and which, from my personal experience, resulted in decreasing rather than increasing lead production."



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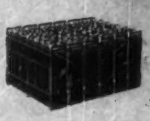

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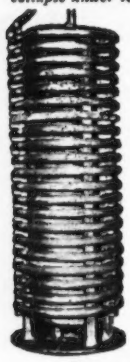

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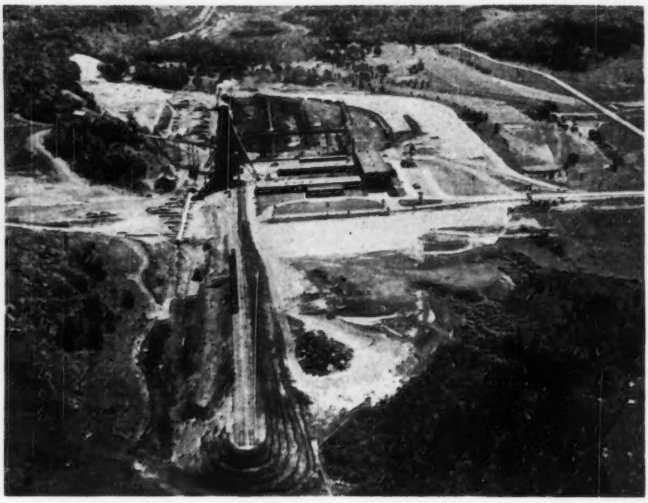

NEW TRESTLE at Cleveland Cliffs' Mather "A" Mine will stock million tons of ore.

IRON COUNTRY

★**Pacific Isle Mining Co.** shipped 277,286 tons in 1949 from eight properties. Largest shipment was 123,677 tons from the York mine at Nashwauk.

★**Charleson Iron Mining Co.**, in 1949, shipped 146,520 tons concentrated from the old low-grade Missabe Mountain mine stockpile. A large tonnage still remains in the pile.

★**Rhude & Fryberger** report 1949 shipments of 249,645 tons. The ore came from three mines: the Pennington, on the Cuyuna, and the Seville and Troy, on the Mesabi.

★**Pickands, Mather & Co.**, with total shipments from all six ranges (the only company operating on all the Lake Superior ranges) of 12,054,578 tons (including all rail shipments and ore lost in transit) was second in volume to **Oliver Iron Mining Co.**

The Mahoning was P.M.'s largest shipper with 2,740,216 tons, followed by the Scranton with 1,277,802 tons and the Embarrass with 1,062,892 tons, maintaining the order of 1948.

★**Wheeling Steel Corp.'s** Wacootah mine at Mountain Iron shipped 188,157 tons in 1949. In 1948 the shipment was 223,028 tons, the total shipments for the two years thus being larger than the estimated ore reserve as of May 1, 1948. This is not unusual due to the difficulty of making an accurate estimate of remaining ore as a pit nears its final years.

★**Oliver Iron Mining Co.**, leading Lake Superior producer, shipped 31,842,122 tons during 1949 from the Vermilion and Mesabi ranges. The former accounted for 896,409 tons of the total — all from underground mines: the Pioneer, Sibley and Soudan. Ten properties shipped more than 1 million tons each. The Hull-Rust group lead with 6,195,651 tons. The Rouchleau group at Virginia was second at 3,824,277 tons; Monroe group at Chisholm third, 2,590,277 tons; Sherman group at Fraser fourth, 2,586,819 tons and the Mountain Iron pit was in fifth place with 2,280,503 tons being shipped.

★Third highest shipper in 1949 was **M. A. Hanna Co.** with a total of 9,124,822 tons, about two-thirds of which (6,023,000 tons) came from the Mesabi range. The Menominee, Marquette and Cuyuna ranges (with 102,158 tons from Spring Valley, southern Minnesota) made up the balance. No one mine shipped as much as one million tons, but the Mississippi group, numbers 1, 2, 3 and 4, made a total of 1,113,194 tons. Mississippi No. 2 led the list with 640,527 tons, the Buckeye on the western Mesabi being a close second at 637,147 tons.

★**E. W. Coons Co.**, of Hibbing, reports total iron ore shipments for the 1949 season of 357,785 tons from three mines: the Commodore, Julia and Genoa-Sparta. The latter mine shipped 253,701 tons and is doing some stripping during the winter.

★Butler Brothers group of mines of the **M. A. Hanna Co.** moved 669,492 cu. yd. of stripping during December from the Galbraith, Argonne, Weggum, South Agnew, Olson and Kevin mines, in addition to 264,484 tons of crude ore at the Kevin. A new scale house is being built in the Kevin pit. Stripping from the Argonne is being used to raise the Galbraith tailings dam.

Dewatering is underway at M. A. Hanna's Morton mine, pumping from the old concrete shaft. A 170-B. electric shovel is being set up to begin stripping at the mine. The 25-cu. yd.

dragline from South Agnew will be moved to the Morton in the spring.

★**Inter-State's** Hill-Annex mine at Calumet is stripping on the north side of the pit using rail haulage. The material is being utilized to build a new tailings basin on a stripping dump near the plant. This is necessary because a new lease becomes effective in the spring. Tailings from the plant will be pumped through an 18-in. pipeline to the new basin. Overflow water will be returned to Penacie Lake through a 16-in. line. It is planned to drain the old tailings pond and to use a dragline and conveyor belt for handling as much of the several million tons of old rejects as may be retreated.

Work is progressing satisfactorily on the Hill-Annex washing plant changes. No. 1 and No. 2 units are being replaced by a Heavy-Media spiral unit to handle the jig ore now being encountered in the pit. No. 3 unit will remain as it is for treating the smaller amount of direct wash ore that will be mined in the future. Crude ore from the Sullivan No. 2 pit is being hauled by trucks to a stockpile at the Hill-Annex and will be loaded for concentration at the plant as required.

★At **Inter-State's** Grant mine, at Buhl, structure drilling is being done in the southeast corner of the pit.

★Employees of **Inter-State Iron Co.'s** Longyear mine at Hibbing were presented with the Admiral's safety award on Jan. 19 for having completed a full year with no lost-time accidents.

★Iron mines operated in 1949 by Hedman & Strand have been taken over by the newly-organized **Hedman Mining Co.** of Hibbing. Mr. Strand has disposed of his interest to the new company. The company will operate the Drew-Syme and Croxton mines on the Mesabi range. Officers are: Carl Hedman, president; Hugh Harrison (president of **Pacific Isle Mining Co.**), vice president and Donald Keeler, secretary-treasurer.

★The 11th annual Mining Symposium of the University of Minnesota was held in Duluth Jan. 17 and 18, with 368 men registered. Papers on Tuesday were devoted to problems of concentration, and taconites were obviously uppermost in the minds of those preparing the papers. Wednesday's session was along the more orthodox lines of previous years. Among the papers presented was "Application of Power in Mobile Units" in which Virgil L. Snow, Euclid Road Machinery Co., covered the use of torque converters in trucks and trailer units for off-highway use, accompanied by movies. "Recent Conveyor Belt Developments" was presented by J. S. Seawright, National Iron Co.

★**Republic Steel Corp.** is doing exploratory diamond drilling on the Hagerman property near Crystal Falls, Menominee range, Michigan.

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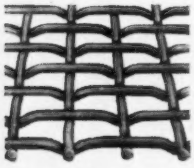

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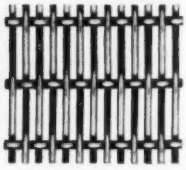

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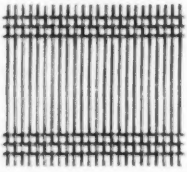

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A CENTURY OF CONFIDENCE

Iron Country *(Continued)*

★**North Range Mining Co.** from its three mines on the Marquette and Menominee ranges shipped 360,519 tons in 1949, of which 190,457 tons came from the Blueberry, 55,676 tons from the Champion (after having been closed for about 39 years) and 114,386 tons from the Book at Alpha.

★**Inland Steel Co.'s** largest shipper for 1949 was its Sherwood mine, on the Menominee range. It contributed 420,718 tons to the company's 998,415 total. The remainder came from the Morris and Greenwood mines, on the Marquette range, and Armour No. 1 and No. 2 on the Cuyuna range.

★The Buck unit mines (including the Buck, Zimmerman and Fogarty properties in Caspian and Gaastra) regained the Menominee range lead for 1949 after having been behind **M. A. Hanna's** Wauseca mine for two years. The Buck group shipped 571,287 tons in 1949 while the Wauseca forwarded 527,666 tons.

The Hanna company was the Menominee's leading shipper for the season with 1,529,375 tons. **Pickands, Mather & Co.** was second with 1,036,156 tons. Shipments from the Escanaba docks totaled 3,562,195 tons.

★**Oglebay, Norton & Co.** forwarded 1,287,717 tons of ore through the Ashland, Wis., docks during 1949, except for a small amount which was shipped all rail. Of this total, the Montreal mine shipped 943,472 tons (1,248,011 in 1947 and 1,077,033 in 1948) and the Eureka 344,245 tons, also substantially below the preceding two years. The Montreal had 60,445 tons in stock Nov. 30 and the Eureka about 8,000 tons less. Both mines are on the Gogebic range.

★Formal presentation of the Sherwood mine's 1949 safety award was made by L. B. Hunter, manager of raw materials for Inland Steel Co., Jan. 7. The 20x20-in. stainless steel plaque was accepted for Sherwood employees by Capt. Walfred "Hy" Johnson, and master mechanic, Harold Sleeman.

★**M. A. Hanna's** Hiawatha No. 1 mine, with 134 employees, has operated 19 months—a total of 260,000 man-hours—with no lost-time accident.

★**Cleveland-Cliffs Iron Co.** has announced an increase of 50c. a ton in the price of iron ore for delivery in 1950. The company stated it had already sold "substantial tonnages" with a guaranteed 51.50% natural iron content at the new prices. These prices are: Mesabi range non-bessemer ore, $7.70 per ton; Mesabi range bessemer ore, $7.85; Old range non-bessemer ore, $7.95; Old range bessemer, $8.10; high phosphorus ore, $7.70.

★**Steep Rock Iron Mines, Ltd.,** shipped 1,134,261 tons in 1949 as compared with 686,385 tons in 1948.

★**Steep Rock Iron Mines, Limited** and the **Inland Steel Co.** of Chicago, have announced an agreement which gives Inland an option to lease from Steep Rock "a large undeveloped acreage known as the 'C' orebody underlying the eastern portion of Steep Rock Lake, Ontario, for exploring and developing a new iron ore mine." The announcement came from Donald M. Hogarth, president of Steep Rock and Philip D. Block, Jr., vice president of Inland. The acreage optioned to Inland will be operated by them if the exploration program proves up the orebody that is hoped for. Work will begin at an early date.

★Stockholders of **Inland Steel Co.,** at a special meeting on Feb. 15, were to vote on acceptance of pension plan agreements made with the steel workers' CIO, subject to stockholder approval. Inland employees have a choice of remaining in the contributory plan, which has been in effect for some years, or of choosing the non-contributory plan which is general in the steel industry.

★Starting Feb. 1 the Cliffs Shaft mine of the **C. C. I. Co.** went on a six-day work week instead of the former five. C. W. Allen, manager of the company, states this is due to increased demand for lump ore for open-hearth blast furnaces.

★At the Hiawatha No. 2 mine of **M. A. Hanna Co.,** Iron River, Mich., shaft sinking to the 19th level has been completed. This shaft connects underground with Hiawatha No. 2 and ore is hoisted from both shafts. This company is also developing a new level in the Wauseca mine, also in the district, and reports that the Bengal Tully mine will be in production before the end of the year. Development work at the Bengal has been in progress for several months.

KENTUCKY-ILLINOIS

★Flood conditions on the Ohio River in January, the worst in this area since 1913 except for 1937's all-time record, caused suspension of fluorspar mining operations in the Illinois district. The town of Rosiclare, rail shipping point of the industry, was seriously inundated. Railroad service was disrupted for ten days, and water over highways prevented hauling from the mines.

Rosiclare Lead and Fluorspar Co. attempted to keep water out of the Rosiclare shaft by dike construction, but eventually was forced to give up a losing battle and abandoned pumping. **Crystal Fluorspar Co.,** in the Cave-in-Rock section, was shut down by high water Jan. 3, but was able to resume operation Jan. 23 through pumping 2,000 gpm. **Alcoa Mining Co.,** Rosiclare, was shut down; and **Minerva Oil Co.,** near Cave-in-Rock, suspended operation when flooded highways prevented hauling and available storage space for treated spar was exhausted. **Ozark-Mahoning Co.**

milled from its Rosiclare stockpile, but was forced to abandon hauling from the mine. High water has prevented operation at the PMT mine since the first of the year.

Federal and state funds already have been granted and preliminary surveys made for construction of a $500,000 flood wall at Rosiclare, primarily for protection of the fluorspar properties, but "one more flood" arrived too soon, the latest in many that periodically have swept the district.

MICHIGAN

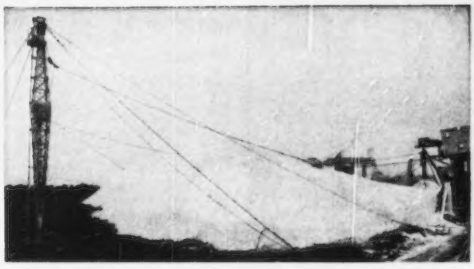
★A uranium ore rush is centering around L'Ance, Mich., due to the find by Eiler Hendrickson, an instructor at Carlton College in Northfield, Minn., who located the ore along the Huron River in the northwestern sector of Baraga County last August. He was employed at the time by **Jones & Laughlin Co.** to prospect with a Geiger counter in that region. The J. & L. Co. has received from the state a lease to prospect on 80 acres of state-owned land, the first lease ever given by the state for this ore. This company has also applied to the **Ford Motor Co.** to prospect on 1,700 acres of their land which lies adjacent to the find. Many similar applications have been made to the state since this one was approved and preparations are underway at L'Ance by many prospectors to get an early start to this district this spring.

★An optimistic outlook for the future of the Calumet Division of the **Calumet & Hecla Consolidated Copper Co.** is expressed by E. R. Lovell, president. Since the Calumet division resumed operations on Sept. 6, 1949, progress has been good except for inventory. Mr. Lovell points out that the inventory at the smelter is higher than planned because of furnace troubles which had not been anticipated.

Mr. Lovell says progress in production and sales is being made in Lake Chemical, a subsidiary; in the secondary department; in industrial and agricultural copper oxide; in the manufacture of Liddicoat underground drill bits; Prozite, a polishing compound molded into bars for use in metal work, and in production of commercial castings in the company's foundry. The creation of new products has created work for 400 men.

Both the Wolverine Tube division in Detroit and the new tube plant at Decatur, Ala., are doing well, according to Mr. Lovell. New business is being sought by enlarging the sales force and getting additional warehouses throughout the country. Foreseeing keen competition in the sale of tubing, Calumet & Hecla is considering the manufacture of aluminum, steel and plastic tubing, in addition to copper. The Rosenquist electroformed tube is being produced in large quantity.

SAUERMAN FOR FAST MATERIAL HANDLING AT LOWEST COST



Starting its 17th year stockpiling rock, this Sauerman Scraper is good as new

The Sauerman Power Drag Scraper pictured above building a stockpile of crushed gypsum rock at a wallboard mill, has moved more than a million tons of rock into and out of storage since it was installed in 1934. This mill receives all of its gypsum by boat in order to take advantage of low cost water transportation. Some 80,000 tons has to be stored during the five-month navigation season and then reclaimed during the remainder of the year. When a boat is being unloaded, about 2500 tons of rock a day must be moved out onto the pile. This is accomplished by operating the 2 cu. yd. scraper two 8-hour shifts. When the stockpiling is completed and the scraper bucket is turned around to reclaim, it is put on a short shift because all it has to do is to move 400 tons of rock daily to a hopper at the mill.

Easy to Operate and Maintain

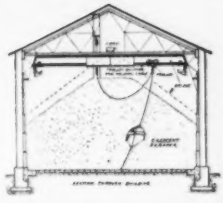
The years of rugged action have not impaired the machine's capacity. It still performs as it did when new and it requires little attention for repairs. Maintenance is estimated to average less than one cent per ton of rock handled.

There are no labor problems here. The scraper is operated by one man and he likes his job. He is housed comfortably and the physical demands of the work are comparatively light.

Engineering Service and Catalog

This gypsum handling installation is just one of the many types of drag scraper machines developed by Sauerman engineers in 41 years of service to industry. A hundred other installations, some smaller than this one and some much larger, are described and illustrated in the Sauerman Catalog 19-E. This book explains the different ways to apply drag scrapers to meet varied conditions. The important mechanical details of the equipment are illustrated together with many pages of mechanical data.

Write for this Catalog 19-E today. At the same time tell us about your bulk storage problem and our engineers will advise you what equipment they consider will give you the best results.

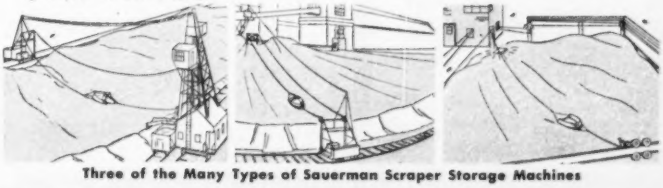


Indoor Storage by Drag Scraper

Sauerman scrapers are used inside bins and buildings wherever conditions prevent handling material solely by gravity. The scraper is able to move material to and from all corners of a building and no space is wasted.

Even sticky material is reclaimed efficiently. One of the Sauerman methods of handling non-caving material is shown in the above cross-section of a storage building. Here the scraper tail block is attached to an overhead trolley which travels from side to side and from front to rear of the long building. Simpler arrangements of scraper equipment are used when the material is loose or semi-caving. The various schemes are explained and pictured in a special chapter in Catalog 19-E.

★



Three of the Many Types of Sauerman Scraper Storage Machines

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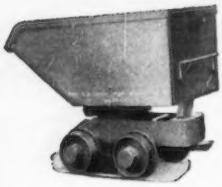

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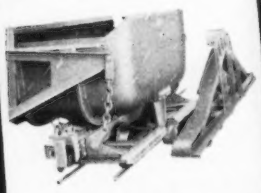
CARD CARS are designed to meet the special conditions in your mine. They are "engineered to the job."

"Lowest Cost Per Ton-Mile Haul"



Ask for Catalog 40 — Today

C.S. Card Iron Works Co.
Denver, Colorado

New Company Enters Potash Field

Duval Texas Sulphur Co., which has acquired large holdings in the heart of the Carlsbad potash area about midway between the operations of the **Potash Company of America** and the **United States Potash Co.**, is proceeding with plans to construct mining and refining facilities. The construction program will take about two years. Approximately $7.5 million will be spent to develop the property.

In Nov., 1949, it was reported that the company had a lease on 13,000 acres of state land and a prospecting lease on 40,000 acres of federal land. Reserves of potash under 2,560 acres covered by one of the permits are estimated at 14 million tons.

About 74% of Duval's shares are owned by the United Gas Corp. George F. Zoffman is president, and Howard Van Sandt is in charge of current activities at Carlsbad. Other staff members of the Duval Company are Douglas Bowen, geologist; J. W. Borskey, chief chemist; and W. P. Morris and George Atwood, formerly of International Minerals and Chemical Corp.

Michigan *(Continued)*

Relative to C. & H. wages and salaries, Mr. Lovell said: "We realize that wages and salaries are not satisfactory. At present the company is in no position to increase wages, but any increase in the copper price or subsidy help will be immediately reflected in increases in wages and salaries. If the price of copper should increase an eighth of a cent a pound, wages will be increased three cents per hour, and salaries increased correspondingly."

★James G. Pearce, Inspector of Mines for Houghton County, reports that there were no fatal mine accidents during 1949. There were 306 men employed in underground work against 403 in 1948. Of the 306, 243 were **Calumet & Hecla** employes (with 1,292 on surface and at mills; 46, **Copper Range Co.** and 17 at **Isle Royale**. Men employed in the mines in Houghton County as of Dec. 31, 1949, totaled 1,818, including underground and surface. In 1927 this figure was 4,823 men, which demonstrated copper country problems.

★W. Parsons Todd, president of **Quincy Mining Co.**, in his report covering the first half of 1949 states:

"Treatment of stamp sands at the reclamation plant continued on a satisfactory and profitable basis. The plant operated without interruption and handled 523,987 tons of sands with a copper recovery of 2,654,657 lbs., an average of 5.07 lb. of refined copper per ton. Tailings carried an average of 1.69 lb. copper per ton, a very satisfactory recovery.

NEVADA

★The Cordero quicksilver mine near McDermitt in Humboldt County will close permanently soon after **Feb. 15**. The announcement was made by J. E. Gilbert, manager of the company's headquarters in San Francisco, who blamed the shutdown on inability to meet high production costs at the present market price of quicksilver.

The Cordero, one of the biggest producers of quicksilver in the country, was discovered nearly 20 years ago and has produced more than 20,000 flasks since then. Average postwar production has been about 400 flasks monthly. The closing of the mine, Gilbert said, is definitely not due to lack of ore, but the company has no plans for resuming operations later.

★Steps toward reactivation of uranium prospector training in Nevada are being taken, the department of vocational education has announced. Donald C. Cameron, state director of the vocational department, said plans include an itinerary which would be an extension of the successful start that was made along those lines last spring. At that time Marty Hess, expert in uranium prospecting, conducted classes in 38 schools, attended by 1,924 Nevadans.

★An exceptionally rich and large oreshoot has been developed at a depth of about 500 ft. on the White Horse claim of the White Rock group in Esmerelda County. A width of ore said to average in excess of 1 oz. of gold per ton was being broken early in February to supply the 100-ton capacity mill. The shoot has been drifted on for a length of 90 ft. or more without indication of limit. Newmont Deep Mines Co. is in charge of the operation, which has headquarters at Goldfield.

★**Basic Refractories**, operating in the Gabbs area of Mineral County, shipped 4,500 tons of crushed brucite during January. The shipment filled 80 cars and went to the company's eastern plant at Maple Grove, Ohio. Some new equipment has been installed in the concentrator building constructed by BMI at Gabbs during the war, and all material shipped now is put through a series of three crushers located in one section of the building. The Gabbs property is said to be the only commercially important deposit of brucite in the world.

NEW MEXICO

★A. B. Bowman, general superintendent, **Banner Mining Co.**, Lordsburg, reported increasing activity at his property, where principal production is copper, lead and zinc. He said more men were to be hired immediately.

★Chino Mines Division, **Kennecott Copper Corp.**, Santa Rita and Hurley, is operating on a six-day week after some short shifting last fall.

★E. B. Killion, Silver City, reported he has located uranium ore on more than 2,000 acres 17 mi. from the city, over half of which is on public domain and half on an old patented homestead claim.

★William Houser, of **Hammer & Houser,** is producing some high-grade silver chloride ore from the Barahoni claim at Organ.

★M. F. Drunzer has opened the old Stauber mine in the Pastura district, west of Santa Rosa, and is shipping low-grade sandstone copper ore, that had been stripped from the old deposit in past years, to the El Paso smelter for fluxing ore. Preparations are being made for underground extraction of a deposit said to run 5% copper.

★U. S. Bureau of Mines is diamond drilling on the Old Torpedo Property in the Organ district, Dona Ana County, with the purpose of developing copper ore of appreciable tonnage believed to be at about 500-ft. depth.

★**Southwest Potash Corp.** is continuing its drilling operations to explore potash deposits in the Carlsbad district, about 10 mi. northwest of the site of the **Potash Company of America** mine. The company has completed 37 drill holes. Work is in charge of Victor Bongard and F. H. Stewart.

★A strike of 1,500 members of the CIO Mine, Mill & Smelter Workers Union which began Nov. 19 at Carlsbad potash mines was ended with the signing of a new contract Feb. 1. The union's demand for a 25c.-per-hour increase was not granted.

The companies, **U. S. Potash Co., International Minerals & Chemical Corp.** and **Potash Company of America,** are now operating with full forces, around 2,400 men. They had hired about 400 men starting Jan. 23 to operate in the face of the strike, and the settlement did not call for replacement of these men.

The renewal agreement continued the old contract with a few non-economic changes until May 31, 1950. Minor changes were negotiated early in the strike.

Last minute negotiations were disturbed by resumption of picketing and a radio talk by Orville Larson, vice president of the union, who declared that the union would continue to fight. In a formal statement, he said, "This strike was broken by agents of the U. S. Government. Never in re-

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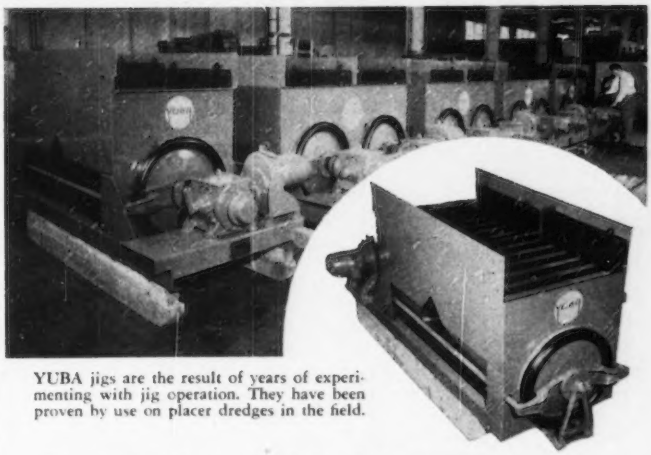
Designed for placer dredges and other installations; adaptable to all placer dredges.



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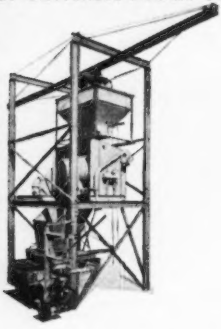

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OPERATION—The actuating cylinder, air-operated, moves a sliding feed box under the hopper, where it is filled with a measured amount of mix. It then slides the feed box forward delivering mix into the molds.

Perhaps you too have a job that can be improved by Ledeen heavy duty cylinders.

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PUSH OR PULL, LIFT OR LOWER, PRESS OR SQUEEZE, TILT OR TURN, OPEN OR CLOSE,

Ledeen heavy duty cylinders, operated by air, oil or water, will do it for you better and surer.

Standard Ledeen Cylinders with rod or head attachments are available from distributors' stock in major cities. Special cylinders on order.

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New Mexico *(Continued)*

cent history has the Government of this nation so completely thrown its resources into a vicious campaign of anti-labor collusion with corporation management."

Meantime, ten members of the union, including C. D. Smotherman, its president, are awaiting a hearing on a charge of contempt in U. S. District Court, Albuquerque, because they disregarded a previous court order to cease blockading entrances of the potash properties and wrote letters to Government officials attacking U. S. District Judge Colin Neblett who had been responsible for the issuing of the restraining order.

★Problems of the western mining industry—taxation, securing risk capital for development, unattractive prices and the inactivity of many mines—concerned the annual convention of the New Mexico Miners and Prospectors Assn. in Silver City Jan. 19-21.

Presiding at various sessions were George A. Warner, president (general superintendent, Zuni Milling Co., Albuquerque); Joseph H. Taylor, first vice president (general manager, Peru Mining Co., Silver City); Dr. Vincent C. Kelley, second vice president (University of New Mexico); Ira L. Wright, director (Silver City consulting mining engineer), and Paris V. Brough, U. S. Smelting, Refining & Mining Co.

Principal speaker at the meeting, Evan Just, editor of *Engineering & Mining Journal*, called on the group to broaden its scope to consider the world wide picture.

"The United States," he said, "is the most important nation in the world today. This calls for a great change in our approach to problems—our economy is a part of world economy."

Another speaker at the convention, Otto Herres, vice president, Combined Metals Reduction Co., Salt Lake City, attacked "discriminatory legislation and confiscatory taxation" which hurts the mining industry "while the ECA builds up foreign competition."

"Our future national security is being sacrificed to present political conveniences," Herres declared. "For 16 years the Government has dealt out subsidies for agriculture and for the manufacturing industry. It has lent encouragement to high wages, cost and price levels, always to be repaid with votes for the party in power."

Also speaking at the meeting were John A. Wood, president, Perlite Products, Inc., Albuquerque; Julian A. Feiss, assistant director, U. S. Bureau of Mines; Raymond W. Jenkins, field engineer, Joy Manufacturing Co., Pittsburgh; Robert M. Hernon, geologist, U. S. Geological Survey, and F. C. Green, W. J. Akert and B. A. Robbins, Chino Mines division, Kennecott Copper Corp.

William H. Goodrich, general manager, Chino Mines division, Kennecott Copper, Santa Rita, was elected to head the association in 1950. T. M. Cramer, vice president and general manager, U. S. Potash Co., Carlsbad, was chosen first vice president and J. B. Carman, manager, Molybdenum Corporation of America, Questa, second vice president. Jack Pierce, secretary-treasurer, Albuquerque, was re-elected.

OREGON

★Gold contributed 95% of the total value of the five metals' (gold, silver, copper, lead and zinc) production in the State during 1949, according to preliminary reports of the U. S. Bureau of Mines. Valuation was $556,150 for 15,890 fine ounces, an increase of 9% over 1948 figures. Total valuation of the five metals was $584,443, an increase of 11% over 1948. Silver production was 13,700 oz.; copper, 24 tons; lead, 13 tons, and zinc, 9 tons. No zinc was produced in 1948. Gold came chiefly from placer workings from **Baker Dredging Co.**'s operations in Baker County and **Porter & Co.** in Grant County. Lode mines contributing to the output, were the Buffalo mine in the Granite area and Champion mine in the Bohemia area of Lane County.

★**Reynolds Metals Co.** let contracts in December totaling $2 million for rebuilding roofs, installation of towers, dust collectors, and hooding of furnaces at its Troutdale aluminum plant in an attempt to control fumes. Escaping fumes have caused farmers and dairymen to bring lawsuits for damages amounting to about $4 million.

★**Spanish Gulch Mines, Inc.**, employed five men late in 1949 at its hydraulicking operations in southeastern Wheeler County on ground which the company leased from Everett Waterman of Mitchell.

PENNSYLVANIA

★**Bethlehem Steel Co.** has made public announcement of its acquisition of a tract of land near Morgantown, southern Berks County, Pa. The area was acquired following an air-borne magnetometer and survey of the Triassic belt in Pennsylvania. This survey was conducted by Bethlehem in the hope of finding additional magnetite deposits of the Cornwall-type of which there were no surface indications.

A number of magnetite deposits and prospects are known in this section, the largest of which are the French Creek deposits, eight miles to the east, worked intermittently as late as 1928.

A diamond drilling program is in progress on the newly acquired tract to determine the geologic features in more detail.

TENNESSEE

★**Tennessee Copper Co.** has signed a new contract with locals of the International Chemical Workers Union, according to James D. Willis, union representative. Contract called for an across-the-board increase of 5c. per hour, effective the first of the year. Average daily wage is now $11.21. Benefits in effect since last October include longer vacations, paid holidays, paid insurance, shift differential increase and call-in time.

UTAH

★Efforts to effect the reopening of **Park Utah Consolidated** and **Silver King Coalition** mines at Park City are continuing, with operators of the silver-lead-zinc operations making concrete pay scale proposals that are "being given utmost consideration" by officials of the United Steelworkers of America, CIO. The mines shut in July, 1949, as a result of metal price declines.

After sessions with James Ivers, vice president and general manager of Silver King Coalition, Paul H. Hunt, vice president and general manager of Park Utah, issued the following joint wage proposal:

1. A $240-$245 per month minimum wage.

2. A sliding scale above this base giving miners a proportional increase in pay related to any boost in metal prices.

3. Pay increases of an incentive nature to be based on increased efficiency in production.

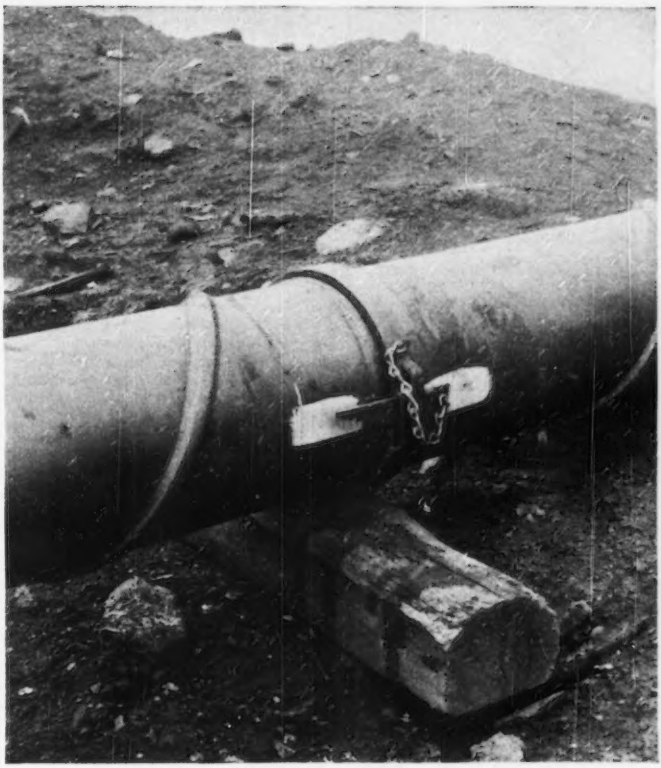
In making the proposals public, Hunt noted they would permit operations at "a break even point," adding "we will not make any big profits on this."

Mr. Hunt stated the operators would permit the CIO union to audit their books "to prove a wage reduction is an absolute requirement for reopening the mines. We tried to operate for six months of 1949 at the old wage rate but could not break even."

Efforts to reopen the two mine properties, which employed some 700 men, nearly half the working population of Park City, were redoubled in early January when Utah's Gov. J. Bracken Lee, reporting state efforts to bring an end to the shutdown had proved fruitless, expressed the belief the situation seemed "hopeless" and added the miners living in the district should leave the Park City area and seek work elsewhere.

George W. Haycock, staff representative of the steelworkers, representing the Park City local, has indicated the new proposals might serve as a basis for negotiations "so we can get those mines running."

★A new and promising ore discovery has been reported at the Horn Silver Mine near Frisco and Milford by of-



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Utah *(Continued)*

ficers of Metal Producers of Los Angeles, operators of the property.

The orebody is reported as running 11% lead, 7.5% zinc, 7.8 oz. silver and .04 oz. gold. The find was reported on the 600-ft. level in the famed old diggings. Company spokesmen say the deposit has been penetrated some 10 ft. in three directions, and there is some belief it may trend upwards to the 500-ft. level and westward into virgin ground. The deposit is reported to be a sulphide ore in limestone.

★Fifth District Judge Will I. Hoyt of Utah's district court has upheld (Jan. 21) a State Tax Commission contention that the commission may set a value on ore for tax purposes where the ore is sold under contract between subsidiaries of a parent company.

The commission's action had been challenged by **Columbia Iron Mining Co.** Columbia mines ore in southern Utah and sells under contract to Geneva Steel.

★In a mid-January message to the regional press setting forth the views of the industry as regards current Congressional discussions, Paul H. Hunt, president of the Utah Mining Association, warned that four of the principal mining operations in Utah would be put out of business if the Silver Purchase Act of 1934 were repealed.

Such a repeal has been discussed by the Joint Senate and House Economic Committee, and legislation that might repeal the act was before the House when Mr. Hunt issued his statement.

Companies affected, located in the Park City and Tintic districts, normally employ some 3,500 workers, aside from smelter and transportation forces in allied industries.

Mr. Hunt expressed belief the price of silver would have dropped below the world quotation of 73.25 c. per oz., perhaps to a figure close to 55 c. per oz., during the 1947-48 period if the act were not in force. This would have meant an aggregate loss of $951,667 for the companies involved, and their undoubted suspension of operations, Mr. Hunt said. The figures cited are based on earnings after taxes and before depletion.

He noted that lead-zinc prices were at a record high in 1947, yet but one of the four major Utah companies in the fields would have shown a profit if silver had sold for 55 c. per oz.

★The Utah Copper division of the **Kennecott Copper Corp.** has signed agreements with the International Union of Mine, Mill and Smelter Workers covering 2,460 men at its mines and mills.

The contracts, effective Jan. 28, run until June 30, 1951. An increase of 40 c. per day retroactive to Dec. 16, 1949, is a principal feature of the pact. The agreement, announced by company labor relations director J. C. Landenberger, Jr., and Al Skinner, regional director of the union, came at the close of negotiations that had continued intermittently since October, 1949. Inar Larson, president of Arthur-Magna Millmen's local 392, signed to represent some 1,485 mill employees, with Thomas Mannion, president of the Bingham Open Pit Miners local 485 representing 975 mine workers.

Negotiations were still underway in late January to cover Garfield Water Co. employees also represented by the Arthur-Magna Millmen's local.

The contracts with open pit and millmen workers do not provide for reopening during the period covered. However, a formal letter sent union representatives by Kennecott officials states that, on or after June 1 of this year, the company will negotiate on means and facilities "whereby employees may reach their respective places of work after entering company property."

★Latest development in the Marysvale district is an announcement by the Atomic Energy Commission that a small uranium depot and ore sampling station will be established immediately in the Piute County community. F. H. McPherson, head of the AEC raw materials purchasing station at Grand Junction, Colo., said that leases on buildings and grounds for the station would be concluded by mid-February.

The Marysvale operation will be comparatively small until the extent of the uranium-bearing ore deposits in the area is more completely established. According to McPherson, the AEC will consider construction of a processing plant if ore is found in sufficient quantities.

WASHINGTON

★**American Zinc, Lead & Smelting Co.** has renewed its contract with Grandview Mines for the continued operation of the Grandview zinc-lead mine at Metaline Falls, according to Fred L. Wolf, president of Grandview. Operations have been on a royalty basis since June, 1936, and the new contract beginning Jan. 1, 1950, provides for a 50-50 division of net profits. Royalty payments from the former operations have netted the Grandview company $430,000 which has been paid out in dividends. The mine has been idle for more than a year because of a miner's strike, during which time the American Zinc company developed new ore reserves and improved mining and milling facilities.

★**Manganese Products, Inc.**, of Seattle, which expects to produce manganese oxide concentrate early in 1950, has had its research work done at the University of Washington under the direction of Dr. R. M. Moulten, a technical director of the company and

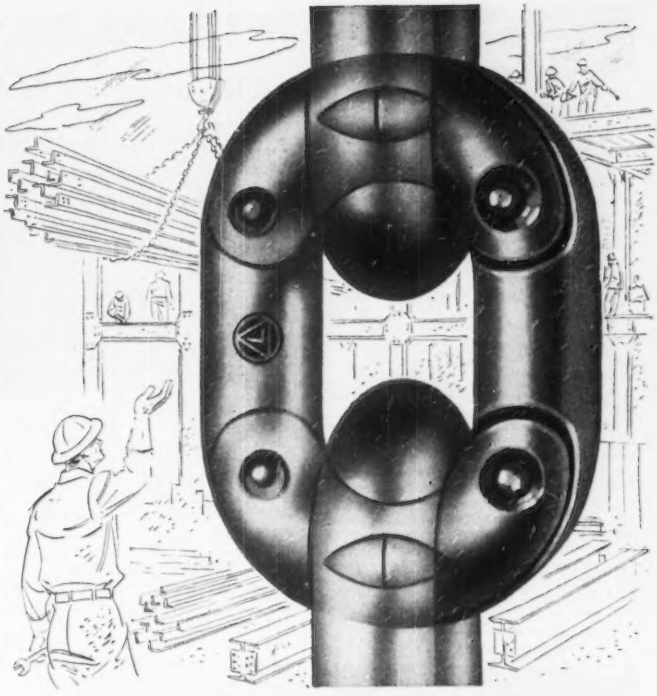
$150,000 CONTRACT is signed by W. B. Neill (seated), president of Spokane Portland Cement Co. to acquire dust recovery equipment from Western Precipitation Corp. W. L. Penick represents the latter company.

assistant professor in chemical engineering. Low-grade domestic manganese ores will be used. The processing will be done at the aluminum plant at Salem, Ore., which was recently purchased from WAA for $750,000.

★**Howe Sound Mining Co.**, which operates the Holden mine in the Cascades, is reported to be considering offering 76,000 shares to common stockholders of a new convertible preferred stock. It is said that proceeds will be used to develop properties, especially the new cobalt mine at Forney, Idaho.

★**Kaiser Aluminum & Chemical Corp.** is now employing 3,600 men in the state. The local monthly payroll at its Mead and Trentwood plants exceeds $1 million. Two hundred business firms in the state are fabricating aluminum. More than 4,000 aluminum products are now listed. The Trentwood plant is shipping 90 carloads a week, or 22% of the national production, according to Ted Smith of the Kaiser company. About 400 cars of alumina a month are shipped to the plant from Louisiana, he said. Although the plant now operates on bauxite from South America he predicted that it may not be long before the company would have to depend on aluminum clays from the Northwest.

★U. S. Bureau of Mines reported that the total value of copper, lead, zinc, gold and silver produced in Washington in 1949 was $9,475,582 as compared with 1948 production valued at $11,171,715. An estimated 23 lode mines were operating in 1949 as compared with 30 in 1948. State output for 1949 was 67,600 oz. gold, 337,000 oz. silver, 5,090 tons copper, 6,200 tons lead, and 11,045 tons zinc.



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IN CANADA

• Optimism on B. C. Steel Industry

• Yellowknife Increases Tonnage

BRITISH COLUMBIA

★Preliminary estimate of British Columbia mineral production for the year 1949, released by Minister of Mines R. C. MacDonald, is $130,800,000, compared with $152,525,000 for the previous year. This revises an earlier estimate made public in October. In the revised estimate, now released, prices for major metals are based on actual prices to the end of November. Prices for gold, silver, copper, lead and zinc include the exchange premium for the final months of the year. Estimated values for major items of mineral production, with 1948 figures in parentheses, are: Gold, placer, $530,000 ($585,000); gold, lode, $9,865,000 ($10,018,000); silver, $5,045,000 ($5,038,000); copper, $11,430,000 ($9,616,000); lead, $43,250,000 ($60,072,000); zinc, $36,225,000 ($41,234,000); coal, $11,000,000 ($10,854,000); structural materials, $8,650,000 ($8,968,000); miscellaneous metals, minerals and materials, $4,700,000 ($6,137,000). Average metal prices used in the estimate, with 1948 prices in parentheses, are: Gold, fine oz., $35.87 ($35); silver, fine oz., 73.76c. (75c.); copper, lb., 19.86c. (22.35c); lead, lb., 15.73c. (18.04c.); zinc, lb., 12.38c. (13.93c.).

★Continued and increasing cooperation of B. C. mining operators was urged as the only means of overcoming economic and administrative problems, by Dale L. Pitt, managing director of Silbak-Premier Mines, at the annual meeting of the Mining Association of B. C. in Vancouver. Mr. Pitt, president of the association, was re-elected.

E. C. Roper, general manager of Britannia Mining & Smelting Co., Ltd., was re-elected vice president representing metaliferous mines. T. H. Wilson, general manager of Crows Nest Pass Coal Co., was re-elected vice president representing coal mines.

Executive committee for 1950 includes A. S. Baillie, Granby Consolidated; H. E. Doelle, managing director, Sheep Creek; S. T. Fraser, director, Polaris-Taku; F. W. Guernsey, president, Island Mountain; H. T. James, managing director, Pioneer; A. L. Johannson, Consolidated Mining & Smelting; A. E. Jukes, president, Sheep Creek; F. A. McGonigle, manager, Kelowna Exploration; M. M. O'Brien, vice president and managing director, Bralorne; J. A. Pike, manager, Island Mountain; H. L. Plommer, manager, Canadian Collieries; R. H. Stewart, consulting engineer; D. S. Tait, president, Privateer, and W. L. Ziegler, general manager, Reeves-MacDonald.

★Possibility of a steel industry for B. C. sooner than expected, reports of exploration for new mineral deposits by large United States firms in the province and a plea for special Government tax concessions to promote mining development highlighted the 37th annual meeting of the B. C. & Yukon Chamber of Mines at Vancouver in January. Mines Minister R. C. MacDonald reported several "substantial" groups have approached him with the object of establishing an iron and steel industry in B. C. and are now actively engaged in investigating possibilities. He said the Government would encourage such a move. Potentialities studied by the Government during the past year indicated deposits of average 67% iron at Zeballos on the west coast of Vancouver Island totaling an estimated 800,000 tons, with a possibility of 400,000 to 800,000 more. The Iron Hill deposit at Quinsam Lake on Vancouver Island, near Campbell River, site of the Government-owned power plant, was set at 1,700,000 tons and recent drilling may double this amount. Two million tons are indicated in the Texada Island deposit, and there are numerous other showings along the coast. Limestone and coal, necessary in iron-steel production, are in abundance, he said.

Among the high points in the year, Mr. MacDonald noted the production of indium by **Consolidated Mining & Smelting Co.** at Trail. Perlite, for use in lightweight concrete, insulation and sound-proofing also is becoming an important product with deposits currently being mined by **Gypsum Products Co., Ltd.,** and Francois Lake. Among the mines that showed favorable results during the year were Polaris-Taku, the recently-reopened Silbak-Premier, Torbrit, Silver Standard, Bralorne, Pioneer, Emerald, Sheep Creek, Silver Giant, CM&S, Granby and Britannia. Exploration of power resources for establishment of a major refinery by **Aluminum Company of Canada,** also meant a big forward step in B. C.'s industry, he said.

★Values in gold, copper and zinc have been discovered in diamond drill intersections 100 to 200 ft. below the present bottom level at B.R.X. mine, Bridge River. Dr. A. C. Pentland, consulting geologist, was scheduled to visit the property in an effort to correlate the new intersections with the California workings above.

★Utica mine, in the Slocan area, has

continued to operate despite severe winter weather. The mountain road to the workings has been kept open and it is planned to continue operations until the snowslides start. Col. D. M. Armstead, president, reports a carload of ore shipped to smelter averaged 176.8 oz. silver per ton, 18% lead and 32% zinc. Ore is now reported in four faces and the stope on the east vein is improving.

★A new roaster is in operation at **Polaris-Taku Mines, Ltd.**, plant at Tulsequah. G. W. Robinson, mine manager, reports capacity shown so far is between 15 and 20 tons daily, indicating it will handle about two-thirds of production. The new cyanide plant also is in operation with satisfactory results indicated. Expectation is that when sufficient roasting equipment to handle all concentrates is installed, a saving of $2 per ton in costs will be attained.

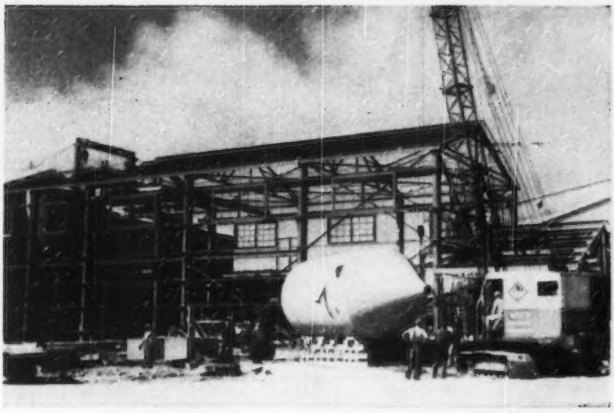
★Jersey lead-zinc plant of **Canadian Exploration, Ltd.**, at Salmo, was closed for repairs and alterations from Dec. 6 to Jan. 6. Company officials plan to increase production from 300 tons average daily to 500 by major repairs to the aerial tramway.

★**Yuba Consolidated Goldfields** will start work on the Quesnel River in B. C. in the spring, under an agreement with **North American Goldfields, Ltd.**, covering the right to dredge 10 miles of placer leases subject to a minimum royalty of 5%. G. A. Collins, president of North American, expects Yuba will handle 10,000 cu. yd. daily. Meanwhile, North American is investigating lode prospects.

★Production of Sheep Creek gold mine during 1949 was estimated at $415,300, for nine months' operation, with biggest output in November and December. Shortage of skilled miners curtailed mill operations, but development and stope preparation were not interrupted. Majority of available miners were employed to maintain production at the company's Zincton mine, A. E. Jukes, president, reports.

★**Zincton Mines, Ltd.**, wholly-owned subsidiary of **Sheep Creek Gold Mines**, has been dissolved in the interest of simplicity, according to A. E. Jukes, president. Zincton's capital issue of shares were owned by Sheep Creek. In the future, various operations of Sheep Creek Gold Mines, Ltd., will be known as the Sheep Creek unit, Zincton unit, Paradise unit, etc.

★**Bralorne Mines**, Bridge River, operated at full capacity. The management reports good results were obtained in development of the 53 vein on the 17th level and the 51 vein on the 19th level. Empire shaft is now 60 ft. below the 26th level and the station is ready. A vein averaging 3.9 ft. wide was cut in this shaft 55 ft. below the 25th level. Assays of samples are mine average. Development of the vein will begin when shaft deepening is completed.



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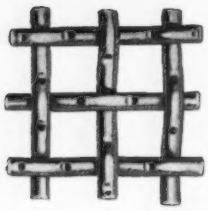

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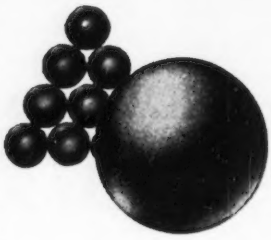

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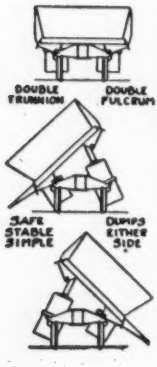

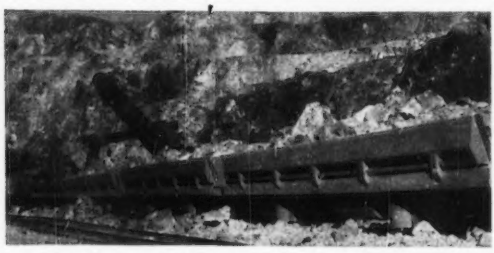

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British Columbia *(Continued)*

★John R. Kenney, mining engineer appointed managing director of **Silver Ridge Mining Co., Ltd.**, made his first report on development progress at the company's property near Kaslo in the Slocan. He says that following the tracing of the Wonderful vein below the old Cunningham workings and location of much surface float in the form of big boulders of galena, the driving of a crosscut intersected a mineralized vein within 300 ft. The vein, lower continuation of the Wonderful, has been drifted on for over 600 ft. with satisfying results. Small lenses of clean galena and clean sphalerite were encountered. With extremely hard walls and the face of the drift within 300 ft. of the downward trend of the upper orebody, he expected ore should be encountered in the face at any time. The 1950 program will include resumption of exploration of the Corinth on both sides of the Pearson tunnel.

★New aerial tram cables have been installed at the Monarch mine of **Base Metals Mining Corp.** at Field, and a drive to the surface has been made, with the objective of improving future operations. The cable program necessitated a 10-day shutdown in November. In the Kicking Horse mine No. 1 drift is being advanced and will be connected by crosscut and raise to No. 4 to facilitate mining.

★**Big Four Silver Mines, Ltd.**, Portland Canal district, is planning a $25,000 program to rebuild three towers on the tramline along the Marmot Glacier and carry out other rehabilitation. L. S. Davidson reports that the work can be finished by July 1 if begun before the end of March.

With mining and development carried on at the same time, he expected to have $200,000 worth of high-grade shipping ore ready for shipping to the smelter by summer. Indicated reserves of shipping ore are reported at $3,000,000. Big Four properties include the Porter Idaho, Prosperity, Silverado and Silver Range, which are equipped with mining plant. The company plans to acquire the Ben Holt and the Dunwell, which contain low-grade ore expected to qualify as mill feed.

★Ferrying of ore by chartered plane from Portland Canal area is planned by prospectors who report one of the richest gold strikes in the district's history, at Tide Lake in the East Gold group. Prospectors are Al Phillips, Bill Boedekker and Walter Herman. Phillips recently carried out 39 lb. on his back and sent it to Tacoma where assays reportedly returned a value of about $35 per lb., for a net return of $1,300. Assay was 1,896.74 oz. gold and 2,386.46 oz. silver, per ton.

★**Vananda Mines (1948), Ltd.**, which suspended milling last fall, has mined and sent to Tacoma smelter 450 tons of ore as a result of recent development work on the copper-gold property. The ore is reported to be better than mine average.

★**Silver Standard Mines, Ltd.**, officials report estimated ore reserves in No. 6 vein at the New Hazelton property exceed $1 million gross value to date. The vein currently is being opened on the bottom level at 1,300 elevation and 250 ft. above on the dip of the vein at 1,500 elevation. With ore still in both faces, there are continuous gold-silver-lead-zinc values for more than 200 ft. on the bottom level. On the horizon 250 ft. higher, two lengths of ore have been opened, one 20 ft. and the other 30 ft. and the drift still has about 100 ft. to go to get above the orebody under development below. Channel samples indicate No. 6 will grade higher than $150 per ton, compared with the $40 ore on which the operation was predicated until last fall. Millheads have been raised to between $50 and $60 per ton in recent months by development ore from No. 6 vein.

★Tonnage possibilities of the Cambrian Chieftain property of **Caron Mining Co., Ltd.**, Pender Harbor, Salt Spring Island, will be tested by further exploration, including some diamond drilling.

★**Granby Consolidated Mining, Smelting and Power Co., Ltd.**, has been formally charged with violation of British Columbia's Industrial Conciliation and Arbitration Act.

Information was sworn out at Victoria, Jan. 20, by union officials, Harvey Murphy, the union's B. C. regional director, reported, and the charge has been formally laid at Princeton where the case is to be heard.

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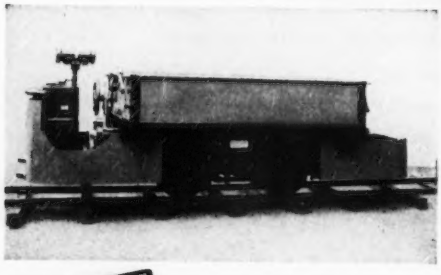

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British Columbia *(Continued)*

Permission to prosecute was granted by the Labor Relations Board after the union alleged the company had violated the ICA act by refusing to arbitrate a dispute over paid holidays provided in an agreement reached by company and union negotiators in November. The agreement provided, along with the elimination of present copper bonuses totaling 75c. and a compensatory $1 shift pay boost, for all Dominion statutory holidays with pay.

Ten holidays were stipulated. Company directors, when the agreement later came before them for approval, contended that there were only seven.

Negotiations became deadlocked and company officials refused to permit arbitration of the dispute on the grounds the old contract had expired. The union stand is that under the ICA act the old contract continues until the new one is signed, and that the contract provided for arbitration of such disputes.

MANITOBA

★**Canus Petroleum Corp.** reports encouraging indications in drilling the Lee Gordon property at Vamp Lake. The first drill hole of the current program cut 126.9 ft. of core containing massive pyrite, pyrrhotite and considerable chalcopyrite. An angle hole cut two sections, one of 10 ft. showing massive pyrrhotite, and the second, of 23 ft., showing quartz and appreciable chalcopyrite. The company has optioned a group of 36 claims adjoining east and north of the Lee Gordon property, known as the Fay Lake group. A gold showing in sulphides was worked by the original operators who shipped three lots of ore to **Hudson Bay Mining and Smelting Co., Ltd.** Canus Petroleum Corp. now has an interest in a total of 117 claims.

★**Sherritt Gordon Mines, Ltd.**, and **Berens River Mines, Ltd.**, have begun drilling operations on their Sourdough Bay option. Drilling carried out last winter indicated a copper-zinc ore zone 650 ft. long and 12 ft. wide grading 1.69% copper and 1.79% zinc. The zone is open to the south.

★**Sherritt Gordon Mines, Ltd.**, reports net working capital position as of Dec. 31, 1949, to be $3,750,000. Another year of profitable operation is expected for the parent mine.

Exploratory drilling on the Lynn Lake property will be resumed shortly. The south drive on the 1,000-ft. level, from the "A" orebody to the "B" is well advanced, and the objective which lies 3,500 ft. distant under Lynn Lake itself, should be reached by next summer.

★**Ogama-Rockland Gold Mines, Ltd.**, has commenced deepening of the main shaft to the 1,000-ft. level. The No.

1 vein and the No. 4 vein were both intersected in diamond drilling put down from the 750-ft. level. The No. 1 vein is expected to be picked up about 150 ft. north of the shaft on the 1,000-ft. level, while the No. 4 vein should be about 40 ft. north. Two new levels will be established.

For the quarter ended Dec. 31, an average of 132 tons was milled daily, for a total of 12,016 tons, after sorting 2,262 tons. Estimated production for the period is $128,400 for an indicated recovery of $10.69 per ton.

★**Hudson Bay Mining and Smelting Company, Ltd.,** has declared a dividend of $1.00 per share, payable March 13, to shareholders of record Feb. 10. The payment, amounting to $2,757,973, brings the company's cumulative total to $94,460,575.

★A preliminary estimate of the mineral production of Manitoba for the year 1949, shows total value of metals produced as $17,118,136, industrial minerals as $7,017,195, for a total mineral production of $24,135,331.

NORTHWEST TERRITORIES

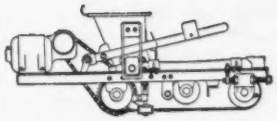
★**Giant Yellowknife Gold Mines, Ltd.,** Great Slave Lake area, reports gross value of output as $766,317 for the quarter ending Nov. 30, 1948. Average tonnage for the quarter was 348 daily, reached progressively from a previous 235 tons daily. Average grade of gold was $25.33 (at $38.50 per oz.) and average costs, including bank interest and administration expenses, totaled $13.25. Broken ore reserves are reported at 77,100 tons, averaging $28.49 per ton. Diamond drilling below the fourth level is reported giving encouraging results.

QUEBEC

★Recent drilling on **Noranda's** Gaspe copper property has been in better grade. No definite reduction plans can be announced but it can be assumed that exploratory work will go ahead. It is said that more than 50 million tons of ore are indicated more than half of which runs about 0.9% copper.

★Reported discovery of new gold-silver-lead-zinc ore bodies at depth, beyond the extent of the previous main workings may well slow down the **Golden Manitou's** rate of ore exhaustion. Higher-than-previous precious metal content in the findings may relieve the situation caused by the slump in the price of the mines main product, zinc.

★**East Sullivan Mines** after one year of production are reported to be in good financial shape with profits coming to about $500,000 per month.



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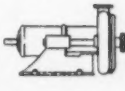

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IN LATIN AMERICA

- Mazapil builds lead smelter
- Chile sets new peso exchange
- Italy buys Chilean copper

MEXICO

★Labor peace was achieved by **Cia. Minera El Cubo, S.A.**, Guanajuato City, Guanajuato, by granting employees a 10% wage increase plus other economic assistance including pensions to those who voluntarily resign. These pensions amount to 20 day's pay for each year of service underground, and 15 day's wages for each year of service for surface employees.

★The rail car shortage in Mexico is still critical. It is so severe that medium and small operators in many parts of Mexico have had to stockpile ore produced—in fact many operators have had to suspend work. The National Railways, Government-owned, has promised early relief.

★Dwindling water supplies have forced the **Mexican Light & Power Co., Ltd.**, to reduce power output by 40 to 60% in parts of Hidalgo, Morelos, Michoacan, Queretaro, Guerrero and the Federal District (Mexico City). Some mines in these areas have been forced to curtail work as a result.

★On the basis of preliminary work performed by Luis Berrioazabal, of Mexico City, and surveys made by Hugh C. Elwes, American consulting engineer, it is expected that tin mining may start up in Central Mexico. Mr. Elwes, whose headquarters are in Taxco, is making surveys for American and Mexican clients.

★**Mazapil Copper** is installing a lead smelter at Concepcion del Oro, Zacatecas. One furnace has been completed and another is being installed.

★The Guanajuato government has announced that the assistance it has been giving to miners of low-grade tracts has stimulated mining. Some of the miners in El Cedro, El Tepozan and Santa Rosa districts are reported to be recovering 10 grams of gold and 200 grams of silver per ton.

★**Cia Exploradora de Isthmo S.A.**, Mexican company organized by Texas Gulf Sulphur Co., has begun exploration work under its recent concession from the government to work sulphur deposits in southern Mexico. A smaller company backed by Mexican capital is already operating there.

Under the recently revised sulphur law of Mexico, the deposits are the exclusive property of the government, but concessions may be granted to private firms. Six percent royalty must be paid to the government. Also, the Mexican market must be satisfied before exporting can be done. The Mexican market is relatively small.

★A cooperative mining research program has been set up by the Mexican and United States governments to increase production of base metals in Mexico, and to assure the U. S. market of a steady supply of copper, lead and other metals from Mexico. The cooperative program, under administration of the U. S. Bureau of Mines and the Comision de Fomento Minero, will provide interchange of technical information between the two countries.

★Reports have appeared in the Mexican press that the government will establish a "large" plant to treat and refine uranium. This follows a recent government declaration that all uranium deposits discovered in Mexico or

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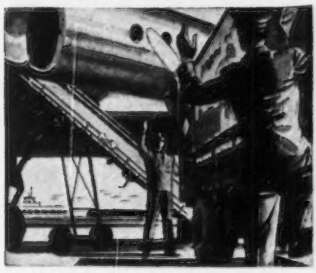

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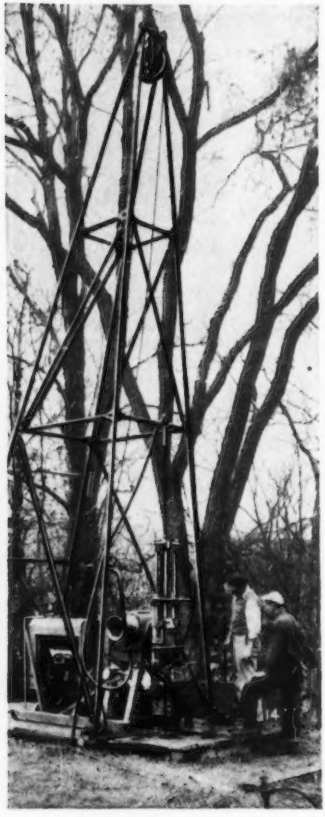

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Mexico *(Continued)*

other radio-active materials must be sold to the government.

★The government is now reported to be seriously considering working the rich Las Truchas iron ore field whose 60% ore has long been under discussion. Lying near the Pacific Coast in central Mexico, it could be an attractive development. **Bethlehem Steel** has had various plans in the past, but has been frustrated by the forces within the Mexican government. The field is now part of the national mineral reserve, but it is reported that the government would like to work the field itself by letting contracts.

CHILE

★A government bill which gives the small and medium size copper mines 30 million pesos during 1949 as a help to compensate for the low rate of exchange given them for dollars has been enacted as a law. This amount is far less than that really due the miners who were compelled to sell their dollars for as little as 40.60 and 43 pesos while the real rate was about 65 pesos.

★Though not confirmed yet, the local press has just announced that a contract has been negotiated between Chile and Italy, under which Chile would export 20,000 tons of semi-manufactured copper to Italy. The buyer is said to be **Cia. Manufacturera Electrica de Roma.** The copper will be exported in Italian ships. First shipment will be 3,000 tons.

★A large and rich placer deposit is reported to have been found in Quilmer hill, Cautin Province in southern Chile in a dry river bed.

★The government has fixed a new provisional exchange rate at 60 pesos to the dollar. Formerly the rate was 43 pesos to the dollar, but exporters including miners are not getting this rate. The Bank pays 43 pesos and the difference is placed in a suspense account until the final rate of exchange is fixed. According to well-informed sources the rate will be 65 pesos to the dollar which will be a big help to the Chilean mining industry. Experience has taught the miners to fear that a new rate of exchange will push costs still higher unless prices and wages are frozen at once.

COLOMBIA

★Gold output in 1949 reached 11,984,387 grams worth about $13,348,000. The output shows an increase of $801,260 (U. S.) over 1948. Oficina de Control de Cambios suspects that a considerable amount beyond the official figure has been exported by smugglers who in turn imported luxury goods for which no import licenses could be obtained.

JAMAICA

★An expenditure of about $14.5 million will be required to develop the bauxite mining project in Jamaica undertaken by **Reynolds Metals Co.**, according to R. S. Reynolds, Jr., president of the company. The operating company, Reynolds Jamaica Mines, Ltd., has recently executed a contract with ECA providing for an advance on purchases of aluminum metal of approximately $11 million to develop the vast bauxite deposits.

More than $1 million has already been spent by Reynolds Metals Co. in exploration, drilling and research to insure usability of the Jamaica bauxite. An additional $1 million will be spent to provide unloading facilities at a Gulf port in U. S. A. and facilities for handling the Jamaica bauxite at the Hurricane Creek alumina plant in Arkansas. Reynolds will also construct a 12,500-ton self-unloading ore carrier which will enable the ship to discharge its cargo in about 8 hr. as compared with three days now required by ordinary freighters.

The Jamaica project calls for the construction of a pier and harbor facilities, a drying plant at the source of ore deposits, an overhead tramway from the drying plant to the sea, mining equipment and auxiliary facilities. It is estimated that it will require 18 to 24 months to complete all facilities.

The ore contains approximately 50% alumina, and silica content is unusually low—½ to 2½%. Jamaica bauxite occurs virtually on the surface and can be mined readily after removing nine inches of overburden. The ore can be used in its natural state without washing.

Mr. Reynolds pointed out that use of low-silica ore to supplement the high-silica Arkansas bauxite will extend the useful life of the Hurricane Creek alumina plant in Arkansas by many years. It will also permit the use of even lower grades of Arkansas bauxite than are presently usable.

Details of the Caribbean aluminum ores were reported in 1948 by O. C. Schmedeman, vice president and geologist of Reynolds Metals Corp. (See E&MJ June, 1948) including information on the Jamaica deposits. On the basis of reserves drilled and sampled at that time it was estimated that Caribbean high-grade reserves totaled about 350 million tons, of which 90% was in Jamaica and the balance about evenly divided between Haiti and the Dominican Republic. At that time Mr. Schmedeman wrote, "They constitute without doubt, the world's largest proved reserves of present economic significance." The Jamaica ores were reported to be essentially residual soils derived from limestone, and accumulated in irregular depressions in the same limestone.

IN AUSTRALIA

• Mt. Isa Stock Wrangle Settled

• Plan W. Australian Gold Development

NORTHERN TERRITORY

★Value of minerals produced in the Territory reached a record £450,000 in 1948-49, including £241,000 worth of gold. The Australian pound was worth $3.24.

Tennant Creek was the source of about 97% of the gold produced and total gold production in the territory was 52% higher than in 1947-48. Australian Development's mine at Tennant creek provided the greatest single development and the most spectacular single crushing in many years —203 tons for 3,706 oz.

★A relatively new field is being explored at Tanami, 420 miles northwest of Alice springs. The two Adelaide-registered **Lady Claire** companies operating in this field have decided to issue more stock to provide further development capital plus additional equipment for open cut mining.

WESTERN AUSTRALIA

★One of the biggest capital flotations in Australian gold mining history foreshadows considerable development in the Yilgarn field. Work is planned there by **Great Western Consolidated N.L.**

The prospecting and development campaign which began there three years ago is said to have revealed 1,290,000 tons of 4.2 dwt. proved ore and 800,000 tons of 5.5 dwt. prospective ore. Properties and options held by Great Western lie along the railway line from Southern Cross to Bullfinch, a distance of 23 miles. Principal mines involved are the Copperhead, Corinthian, Pilot, Fraser's Three Boys and Manxman.

Cost under present conditions, to bring the mines into production plus a complete plant with yearly capacity of 400,000 tons and equipment to keep up underground development for three years, is estimated at £1,408,500.

★Though much less is heard of the Golden Mile's gold bonus than of the Barrier's lead bonus, the system at present is working in favor of the gold miners. Lead and gold mining are the only Australian industries in which the worker's pay is tied to the selling price of the product.

★New shaft put down by **Central Norseman Gold Corp., N.L.**, one mile north of the main shaft has been completed and is now in use. Work started in June, 1947, and the 17x17-ft. shaft was driven on a 41 deg. underlay to a depth of 1308 ft.

★Reopening of the nearby **Norseman** gold mine is still under consideration. It is feared that efficiency of pyrite production may be impaired by mining both gold and pyrite. A profit of £11,749 was recorded for the year ending October 31. In that period the mine produced 12,867 tons of sulphur in concentrates and crushed ore.

★At the annual shareholders' meeting of **Wiluna Gold Corp., Ltd.**, R. Ellerton Binns, chairman of directors, expressed full confidence in the projected development of the Mount Charlotte and Porphyry leases. Development so far has proved the existence of a large massive orebody at shallow depth, and another at a lower horizon. Ore is low grade and could not have been profitably worked before devaluation.

★**Mountain View Gold N. L.** earned £37,332 in the year ended November 30. The company will purchase a battery to be independent of the state battery at Cue. A jaw crusher has already been bought. Ore reserves are estimated at 3,270 tons of main shoot at 3 oz. and 6,000 tons of second-grade ore at 10 dwt. a ton.

★Adelaide-registered **Sterling Gold Mines N. L.** has taken a three-year option over the Corunna leases, a new find 54 mi. southwest of Marble Bar. A crushing of 119 tons from preliminary work on two of six leases, returned 36 oz. a ton. Ore already exposed is estimated at 15,000 tons with a recovery value of 14 dwt.

★At the annual meetings of **Coolgardie Gold Mines, Ltd.**, and **North Golden Mile Options, Ltd.**, it was announced that North Golden Mile was negotiating for disposal of an option at Kalgoorlie.

SOUTH AUSTRALIA

★**Broken Hill Pty. Co., Ltd.**, will have the permanent use of 13 Commonwealth-owned ships to carry iron ore, coke and other materials between Whyalla and Newcastle.

★**Flinders Ranges Silver Lead N. L.** is raising £6,250 by a new share issue to finance new development. The mine has not recovered from a recent fire.

VICTORIA

★H. E. Bolte, the Minister for Mines, said that there were first indications of a revival in gold mining. It had not come sooner after devaluation be-

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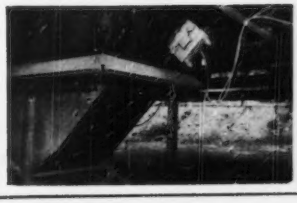

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Victoria *(Continued)*

cause of the labor shortage on the gold fields. The position was aggravated by the steep increase in the cost of mining machinery and equipment. Shortages of iron, steel, cement, bricks and timber had not yet been overcome. To bring mining activity back to the prewar level, another substantial increase in the price of gold would be necessary—presumably by revaluation of gold in terms of the dollar.

★**Northern Star Gold Mines N. L.,** Kevington, is planning to install a battery for the crushing of ore from the Star of the West reef. The reef is 5 ft. wide and contains values up to 2 oz. Pending installation of the battery, stone from the reef will be taken out and stored in a drive 200 ft. long.

TASMANIA

★Production of zinc at the Risdon works of **Electrolytic Zinc Co. of Australasia, Ltd.,** was lower in the first 24 weeks of the current financial year than in the same period last year—37,571 tons compared with 39,338 tons.

At the company's West Coast mines, 73,133 tons of ore were treated during the period for 4,973 tons of lead concentrate, 22,200 tons of zinc concentrate and 1,993 tons of copper concentrate. Corresponding figures for the 24 weeks in 1948-49 were 62,161 tons of ore, 4,540 tons of lead concentrate, 19,775 tons of zinc concentrate and 1,467 tons of copper concentrate. The relatively poor showing of the refinery section was due to transport difficulties.

★Tin producers in this state and elsewhere in Australia have been granted a £100 increase in the official price to £655 a ton. Maximum selling price of tin to users has been raised to £680 ex smelters.

There was no prospect of the tin export ban being lifted or a free market being restored, said **Mr. J. C. Westhoven,** chairman of **Aberfoyle Tin N. L.** The present world price of tin was £750 stg., equivalent to £A938.

He disclosed that diamond drilling had shown that the Aberfoyle mine had much greater potentialities than had been previously thought. Experiments to step up recovery had been carried out with prospects of recovering a further 2 per cent or more of the metal values. Test work was being continued to determine the economics of the process.

NEW SOUTH WALES

★The state's gold output for October, the first post-devaluation month, was 6,206 oz., 609 oz. higher than in Octo-

ber, 1948. The beneficial effect of devaluation is all the more apparent because output for the preceding 9 months was below the corresponding period of 1948.

★Production of lead, silver and zinc by **North Broken Hill, Ltd.**, in the first half of the current financial year was lower than in the same period of 1948-49. Lead and silver content of lead concentrate produced in the 26 weeks to December 31 was 21,748 tons and 1,050,234 oz., compared with 24,-432 tons and 1,237,342 oz. a year earlier. Content of zinc in zinc concentrate produced fell from 18,039 tons to 15,793 tons, a drop of about 2,200 tons.

★Because of labor troubles, the mill of **Lake George Mining Corporation**, Captain's Flat, worked only 80 days in the year ended June 30 last. Nevertheless gross profit for the year was £324,843, £33,000 higher than in the preceding year. This was mainly due to a large profit from the sale of accumulated lead and zinc at the high market prices ruling in the early part of the year. Most of the surplus has been absorbed by taxation (£200,000), depreciation and maintenance and the balance of about £80,000 has been left intact to bolster reserves. During the year, Lake George reduced its capital from £1,100,000 to something like £550,000.

QUEENSLAND

★The hotly disputed capital reconstruction of **Mt. Isa Mines, Ltd.**, involving conversion of American-held debentures, has finally been approved at an extraordinary general meeting of shareholders. The meeting decided to redeem the 6% B debenture stock held by **American Smelting & Refining Co.** for £A646,980. The redemption, subject to A. S. & R. subscribing 462,128 ordinary shares in Mt. Isa, takes effect immediately. A proposal has also been approved to give **Mining Trust, Ltd.**, London, the option to call for redemption at par of £229,158 of the 8% B debentures held by the English company. The amount represents one-quarter of the stock held by Mining Trust. This would normally mature from 1955 over a 10-year period.

NEW GUINEA

★**Gold Mines of New Guinea N. L.** has been registered in Adelaide to investigate and prospect gold-bearing alluvial deposits reported on an old German plan. Nominal capital is £100,000. The area to be explored is located in the central highlands and was mapped by a German expedition in 1892. The proposed field party will conduct the work under the direction of Mr. J. C. Coldham, a consulting engineer.

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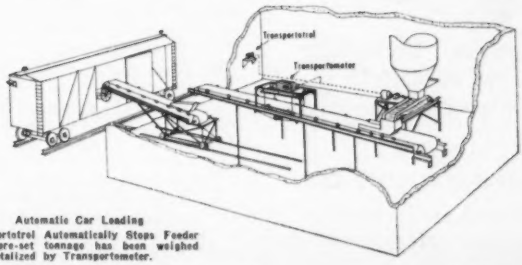

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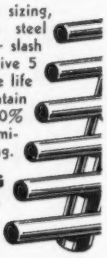

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IN ASIA

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PHILIPPINES

★After pouring more than $8,000,000 into its rehabilitation program, **Benguet Consolidated Co.** got back into profitable operation in 1948 and improved its profit margin in 1949. All indebtedness has been paid off. The new central mill handles 2,000 tons of ore daily and should be up to 4,000 tons in another year or so. The present Government ruling that permits 75% of the company's gold to be sold on the Manila free market means that the average return to the company is about $47 per oz. Benguet was allotted $9,000,000 in war damage claims, and has so far received about $3,000,000 of it.

★The Philippine Government, late in January, modified its earlier ruling to permit gold mining companies to sell 75% of their output on the free market. Only 25% has to be sold to the Government at the statutory price of $35 per oz. The original order, demanding turnover of all gold to the Government, brought a storm of protest from the mining industry. During the brief period when this order was in effect, the free market price of gold went to $75 per oz. When the Government eased the restriction, the price fell back to $54. In view of the Chinese situation, there is some doubt that this price will hold for long.

★**Consolidated Mines**, operated by Benguet, on a profit-sharing basis, is again receiving orders for its refractory chrome ore. For January the mine shipped 8,500 tons to American buyers, with a standing order for 5,000 tons in February. Although less than orders last year, this increase indicates renewed demand. In December only 2,000 tons were shipped.

★**Misamis Chromite**, operated by Soriano interests, has over 1,000 tons of high-grade chrome ore in its stockpile, with a contract for 1,500 tons in January. Development work has been satisfactory.

★**Mindanao Mother Lode** had a gross production of $180,900 in December from milling 10,400 tons averaging $17.40 per ton at the $35 price. Development work on the 850 level is satisfactory. The Tabon vein is strong with good values. The main shaft is being sunk to the 1,050 level, where the three principal veins are expected to be cut. Beginning in January the mill's flowsheet was to be changed to make it possible to re-grind the lead and the iron concentrates and cyanide them. This will result in production of 60% of the gold as bullion and 40% in copper and zinc concentrates. Formerly all production was in the concentrate form.

★**Lepanto Consolidated** continues to make good progress with its mill expansion program. It is hoped that by April the mine will have its second milling unit in operation and will be able to handle 1,000 tons of ore a day. Negotiations are under way leading to sale of the copper concentrates in Japan instead of the United States. December production was valued at $267,500 gross smelter return from 17,600 tons milled.

MALAYA

★Malayan tin production in 1949 set a new postwar record with 55,448 tons, according to the Mines Department at Kuala Lumpur.

★**Kuala Kampar Tin Fields, Ltd.**, has entered the dividend-earning stage. The company's production for the first eight months of the year ending March 31, 1950, was a record.

★**Southern Kinta Consolidated, Ltd.**, one of the biggest producers in the Far East, won 3,602 tons of tin ore in 1949, compared with 1,318 tons in 1948. All this came from the Kinta valley in Malaya. The Siam properties, which were repossessed in 1948, are not yet back in production. Equipment in Malaya comprises ten bucket dredges and a small suction cutter. Three more dredges will be brought into production in the course of 1950.

★Three tin dredging companies showed better results for the year ended June 30, but **Burma Corp.** closed its books again with a deficit.

Renong Consolidated Tin Dredging Co., Ltd., made £58,995 profit for the year, contrasting with £550 in 1947-48. Expenditure on rehabilitation totaled £105,498.

Katu Tin Dredging, Ltd., earned £19,165, compared with £18,399 in the preceding year. Total rehabilitation expenditure has been £51,979.

Burma-Malay Tin, Ltd., reports profit of £2,781, compared with a loss of £381 in 1947-48. The company was mainly engaged in rehabilitating the Renong and Katu properties. Unsettled conditions in Malaya prevented it from prospecting there.

Burma Corporation, Ltd., incurred a loss of £16,579 stg., compared with a loss of £14,180 stg. in the previous year. Production was brought to a standstill last March because of rising political unrest in Burma.

IN AFRICA

• Devaluation is boosting profits

★New cost-of-living allowances will be paid to employees of Southern Rhodesian mines this year. All daily paid employees, about 2,300, will get increases varying from £4 to £6 13s a month, which will be adjusted with rise or fall in the cost-of-living index. Official statistics show that the general cost of living in Rhodesia has risen 49% since the war. Food prices are up 70%.

★Up to £2,000,000 is to be spent on the full development of the 13 gold mines planned for the Orange Free State in the Welkom area, according to Sir Ernest Oppenheimer, chairman of **Anglo-American Corporation, Ltd.**, which plays a leading part in this development. Eight large mines are rapidly developing and five more are beyond the planning stage. In two or three years, Sir Ernest believes, the new gold field will be in operation and should revitalize the whole country. Shaft sinking is being delayed somewhat by underground water flows, and the ironic part is that none of this water is potable. This prevents its use at the surface, where the only available water comes from 40 miles away. At the year's end, the St. Helena shaft, the Free State's first, was down 2,758 ft. from the surface. The Basal Reef lies at about 4,500 ft.

★Value of South Africa's gold production in 1949 was the highest for seven years. Output was the best since 1946. The country produced 11,708,103 oz., valued at £114,899,043. The increased value comes from devaluation of the pound in the last quarter of 1949. Without it, the value of the gold output would have been about £100,000,000. Dividends declared by the Rand mines totaled £4,100,000 higher than in 1948. The biggest profit-earner was Blyvooruitzicht at a profit of £4,146,525. Daggafontein and East Geduld were next.

★**Messina (Transvaal) Development Co., Ltd.**, has decided to modernize its plant. It proposes to enlarge one furnace, build a new converter, and buy a new refining furnace. Improvements will cost about £70,000 and will come out of profits. The new plant will turn out about 15,000 tons of copper a year, more than the company actually needs at present. The high rate is adopted to cut into the company's large stockpile of copper concentrates.

★Because of the increased price of gold (through devaluation of the pound), Cam and Motor gold mine in Rhodesia has begun to look around again on its lower levels for more gold ore. Payable results have been turned up on several levels.

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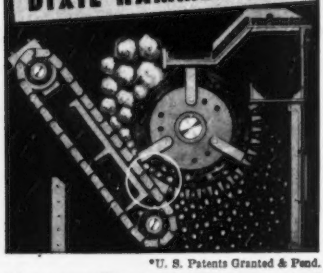

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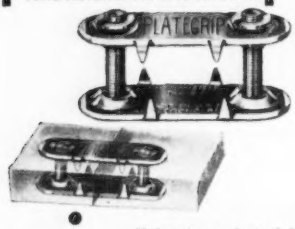

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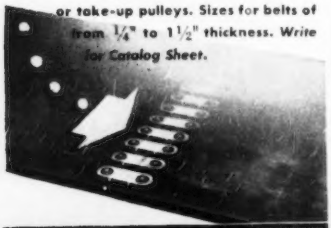

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NEW BOOKS

THE MEASURE OF GOLD. By W. J. Busschau. Available at Central News Agency P. O. Box 4810, Johannesburg, South Africa. Price 12/6; also at Hafner Publishing Co., 31 East 10 St., New York 3, N. Y., $3.25 postpaid. Pp. 164.

In the opinion of this reviewer inflation is a swindle of the industrious and thrifty for the benefit of the lazy and improvident, no matter how you slice it. Nevertheless to face the realities of the present scene, the causes of inflation are deep seated, and it does no good to complain of the price, once the bill of goods has been bought.

Seen in this light, Prof. Busschau's thesis justifying an increase in the price of gold makes sense. This scholarly, readable book points out that considering the concentration of gold in the hands of the nation which needs them least, international trade and prosperity are threatened by a lack of financial liquidity among most other nations. Assuming that the United States is not going to disburse its gold stocks gratuitously, the only feasible way to restore liquidity is to revalue the world's gold stocks upward, and permit greater international control of currency policies. To do this in time may be the key to preventing a depression after 1952.

Recommended as worth reading, particularly by the economists who seem to rule financial policies everywhere, and steeped in the concept that gold stocks are primitive, seem determined to force a new generation to learn human frailty the hard way.

E. J.

BOOKS RECEIVED

The Geology and Ore Deposits of the Boulder Creek Mining District, Custer County, Idaho. By Thor H. Kiilsgaard, University of Idaho. Published as Pamphlet No. 88 by the Idaho Bureau of Mines and Geology, Moscow, Idaho. Pp. 28.

Studies on the Production of Antimony Oxide. By Joseph Newton, Professor of Metallurgy, and W. D. Wilde, Student, University of Idaho. Published as Pamphlet No. 89 by the Idaho Bureau of Mines and Geology, Moscow, Idaho. Pp. 52.

Preliminary Investigation of Concentrating Certain Minerals in Idaho Placer Sand. By W. W. Staley and J. S. Browning, University of Idaho. Published as Pamphlet No. 87 by the Idaho Bureau of Mines and Geology, Moscow, Idaho. Pp. 23.

De Laval Engineer Handbook. Practical information on the design, operation, and installation of pumps, turbines, compressors and gears. Published by Advertising Department, De Laval Steam Turbine Co., Trenton 2, N. J. Pp. 290. Price, $2.

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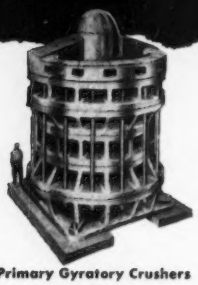

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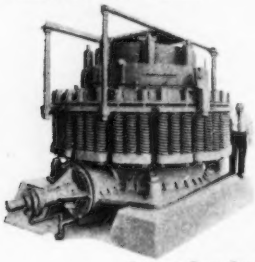

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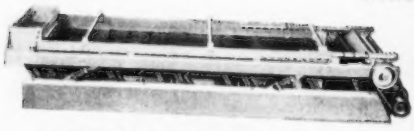

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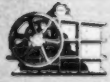

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The first important reversible dipper tooth improvement made in years!

it's new . . . A reversible, self-sharpening and self-hardening tooth.

it's economical . . . Improves digging efficiency. Lasts longer—with higher resistance to breakage. Tips made of Chromanal; Shanks and Adaptors of Manganese Steel.

FEATURES OF THE AMSCO REVER-SHARP THAT LOWER HANDLING COSTS PER TON

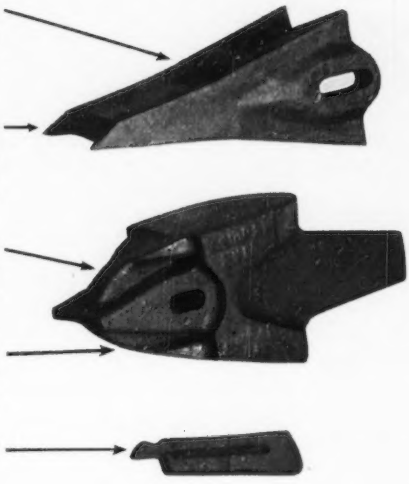
Reversible Tip—Simply turn the tip over when worn. A new, sharp cutting edge is ready for use. Made of Chromanal, the metal that actually work-hardens in service. *The harder you use the Rever-SharP, the harder it gets!*

Unique Cutting Edges—Increase service life and cutting efficiency from 50 to 200%. Reinforced and extended corners take initial impact and work-harden faster; wear is equalized along entire cutting edge.

Special Adaptor—Made of AMSCO Manganese Steel and designed so that extra metal protects base connections and lip from wear. Available to fit all base connections.

Reinforced Nose—Supported along entire length by extended ribs. Protects against bending or breakage. Tip is self-tightening as it is forced against the tapered nose during use.

Trigger Lock-Key—Tapered for easy insertion and removal. Rubber insert prevents loosening in service.



REVER-SHARP ALREADY IN USE—AND SERVICE-PROVED

Acceptance of the Rever-SharP is enthusiastic—*one user reports 6 times the service of former teeth.* Get the complete facts on this new, better dipper tooth. Write today for complete information.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
376 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT: Calol Vistac Oil

UNIT: Main bearing-Sawmill Head-Rig Wheel

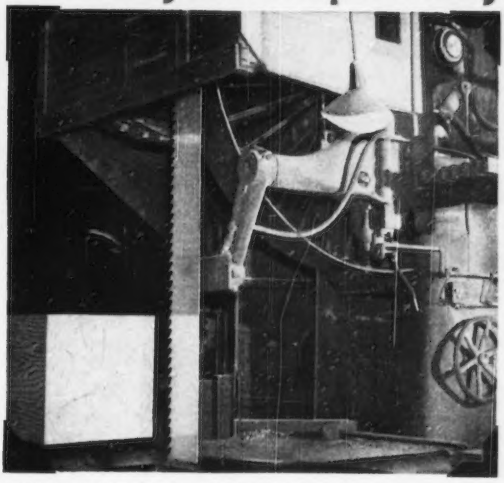
LUBRICATOR: Drip-feed oiler

CONDITIONS: Heavy pressures and tension—intermittent loads

PERIOD: 2 years

FIRM: California Door & Lumber Co. Diamond Springs, California

Tacky oil stops heavy-duty bearing failures

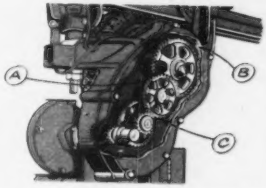


LUBRICATED WITH CALOL VISTAC OIL, the bearing in the 7-foot wheel of this head-rig has been in continuous use for more than two years. Before the sawmill changed to CALOL VISTAC Oil, the bearing had to be replaced every few months.

Mr. William Liddicolt, Mill Superintendent, says, "CALOL VISTAC Oil sticks tight, lubricates the entire bearing surface and doesn't squeeze off even under loads of 20,000 to 50,000 pounds. I also use CALOL VISTAC Oil on bearings in slashers and the hog. It really stands up under the continuous shock loads on hogger bearings!"

REMARKS: This plant has two band mills with 60-foot saws; handles heavy pine and fir timber. By keeping the bearings in good condition, CALOL VISTAC Oil has not only cut operating costs but prevented injury to personnel from saws that usually break when bearings go out.

How CALOL VISTAC Oil will cut costs in the Mining Industry

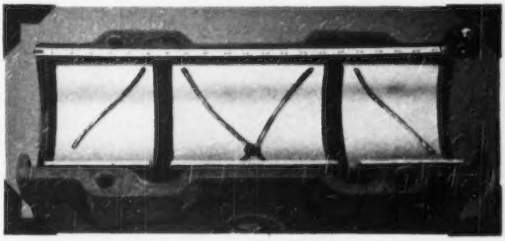


In hoist gear sets, motor gear-heads, air hammers, rock drills, heavy-duty plain bearings, CALOL VISTAC Oil will reduce wear. Atomizes quickly and stays fluid at low temperatures in air tools.

A. Special additives help form oily, pressure-resistant lubricating film...won't run off slow-moving parts.

B. Economical -- small quantity will lubricate efficiently, dissipate heat.

C. Tenacious film cuts power loss and wear.



THIS HEAD-RIG WHEEL BEARING is 7" in diameter, 21" long, babbitt lined, with two oil rings. Tacky CALOL VISTAC Oil carries over bearings, keeps tops lubricated, maintains a rust-proof coating during shut-downs.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

Trademarks, "CALOL," "VISTAC" Reg. U. S. Pat. Off.

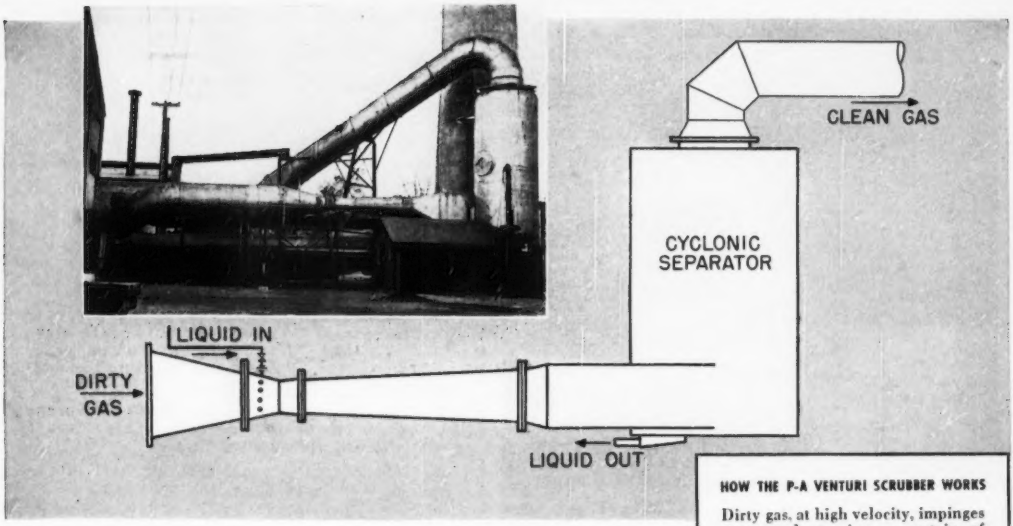
STANDARD OIL COMPANY OF CALIFORNIA • San Francisco
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA OIL COMPANY • Barber, N. J., Chicago, New Orleans
THE CALIFORNIA COMPANY • Denver, Colorado

FOR DIFFICULT GAS CLEANING PROBLEMS

CHEMICO *Now Offers*

The P-A Venturi Scrubber

(A PEASE-ANTHONY DEVELOPMENT)



HOW THE P-A VENTURI SCRUBBER WORKS

Dirty gas, at high velocity, impinges upon and atomizes a curtain of liquid introduced through jets at the throat of the Venturi. Differential velocities of gas and atomized liquid result in collision of mist or dust particles with liquid droplets. The coalescence of mist or agglomeration of dust resulting from this collision makes simple cyclonic separation possible.

APPLICATIONS: The P-A Venturi Scrubber is a highly effective and economical apparatus for solving such major industrial problems as: SMOKE ABATEMENT · REMOVAL OF DUST AND MIST FROM GASES · RECOVERY OF VALUABLE METALS AND CHEMICALS.

ADVANTAGES: Highly efficient—Assures virtually complete removal even of sub-micron dust and mist.

Low initial cost—The first cost of the P-A Venturi Scrubber is considerably less than other equipment of equivalent performance.

Low Maintenance — Its maintenance cost is less than that of other equipment of equivalent performance.

Low Water Requirement — Requires generally less water (or scrubbing liquid) than other liquid scrubbers.

Can Handle Gas At Any Temperature—Pilot Plant tests show no difficulties even at 1800° F. Actual installations now operating at 700° to 800° F.

More Compact and Lighter—It requires less space and is lighter in weight than other equipment of equivalent performance.

Simple and Safe to Operate and Maintain—Any competent maintenance man can service a P-A Venturi Scrubber. No special skill is needed to repair equipment.

Chemico's engineering background and development facilities combined with Pease-Anthony's experience in gas scrubbing offers highly qualified service in this field.

CHEMICAL CONSTRUCTION CORPORATION

EMPIRE STATE BUILDING, 350 FIFTH AVENUE, NEW YORK 1, N. Y.

EUROPEAN TECHNICAL REPRESENTATIVE

CYANAMID PRODUCTS, LTD., BRETTENHAM HOUSE, LANCASTER PLACE, LONDON W. C. 2, ENGLAND

CABLES: CHEMICONST, NEW YORK

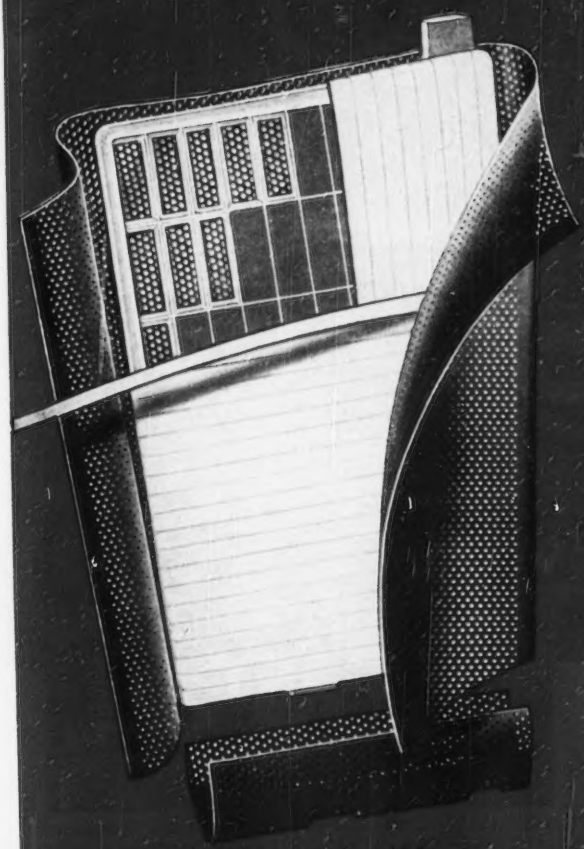
Chemico Plants are profitable investments

Grid Porosity Reduced 85%

IN NEW GOULD "Z" PLATE BATTERIES!

The No. 1 battery problem—positive grid failure due to porosity—has been solved by Gould's modern research laboratory and pilot plant! The new Gould "Z" Plate Battery has the only grid that is solid all the way through. Accelerated laboratory corrosion tests prove, beyond question that Gould's new casting technique of progressive solidification can reduce porosity 83% to 90%!

That's why the new Gould "Z" Plate Batteries stay new longer . . . give more months of full capacity service. Only Gould offers you so much for your battery dollar, because only Gould has the new "Z" Plate! Save money by replacing your old batteries now with new Gould "Z" Plate Batteries. Let us submit a quotation. And write us for literature on the new "Z" Plate Battery, greatest battery advance in years!



Cut-away view of "Z" Plate construction used in the Gould "Dairy" Battery

The Gould "Dairy" Series 6 Heavy Motive Power Battery!

GOULD

STORAGE BATTERY CORPORATION

TRENTON 7, NEW JERSEY

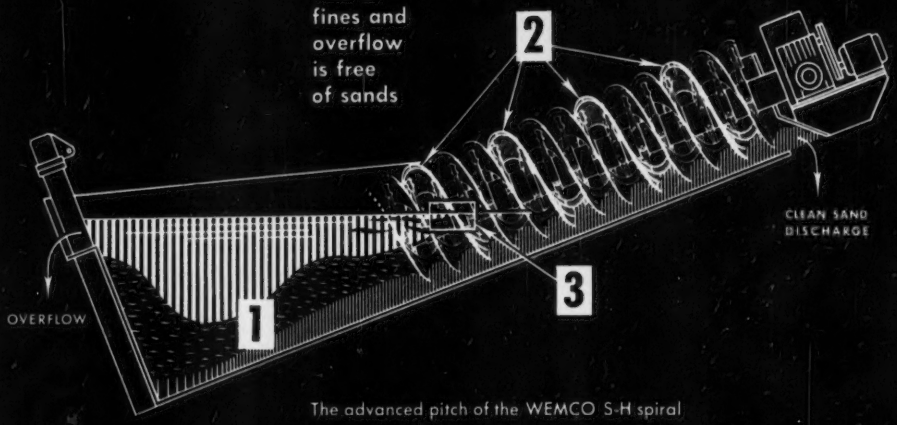
Always Use Gould Automobile and Truck Batteries

DESIGN *MAKES THE DIFFERENCE*

WEMCO S-H CLASSIFIERS provide

SHARPER SEPARATION

Sands are free of fines and overflow is free of sands



The advanced pitch of the WEMCO S-H spiral increases lineal travel per revolution by 50%, and allows the use of up to three spirals per shaft.

This design feature assures sharper separation in three ways:

1 **FASTER SETTLING** · The WEMCO S-H spiral provides greater raking capacity. Therefore, settled sands are removed at a faster rate and a larger, thinner pool is maintained. Maximum settling differential between fine and coarse particles is assured and the coarse particles settle more rapidly than in other type machines.

2 **LESS INTERFERENCE** · The increased raking capacity of the WEMCO unit is accomplished without an increase in speed of spiral rotation. Thus, undesirable agitation of the pool is prevented and there is less interference to settling and overflow.

3 **RAPID INITIAL SEPARATION** because pulp feed and sand removal are kept in balance, hence "sanding up" is prevented and coarse fractions are kept out of the pool as much as possible.

These results of modern, progressive design make WEMCO ***"Best in Classifiers"***

Write for new descriptive bulletin or visit the WEMCO office or agent nearest you.

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WEMCO
WESTERN MACHINERY COMPANY
760-766 FOLSOM STREET · SAN FRANCISCO 7, CALIFORNIA

WKE (HMS) Mobil-Mill • Coal Spiral • Standard Thickeners (HMS) Thickeners • (HMS) Media Pumps • Hydroseparators (HMS) Densifiers • (HMS) Separatory Cones • "SH" Classifiers Sand Pumps • Conditioner and Agitators • Fagergren Flotation Machines • Dewatering Spirals • (HMS) Laboratory Units

We changed from steam to an **Industrial Brownhoist Diesel Crane**

It paid for itself in four years!

Here are the figures to prove it:

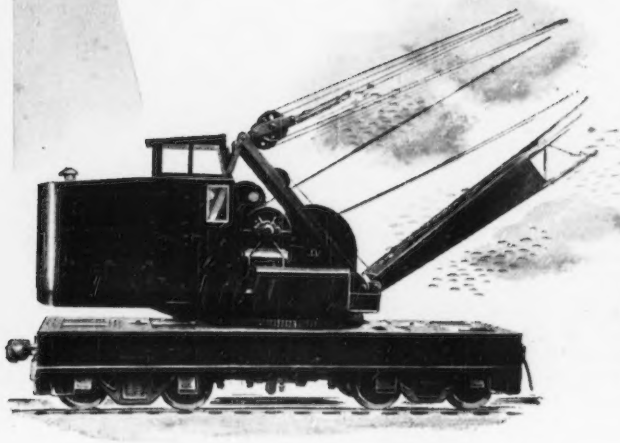
SAVINGS IN FUEL PER DAY $13.40
(Based on 1½ tons coal per day at $10 a ton, against 16 gallons of fuel oil at 10¢ a gallon.)

SAVINGS IN LABOR PER DAY $15.50
(Unproductive firing, banking, cleaning time — 2 hours for engineer at $1.75 per hour, and 8 hours fireman, at $1.50 per hour.)

TOTAL FUEL AND LABOR SAVINGS PER YEAR.. $7,514.00

AND WE INCREASED OPERATING TIME BY 65 DAYS A YEAR!

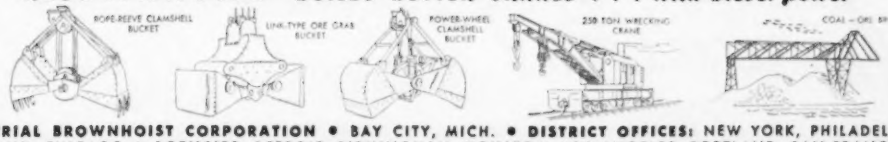
It takes two hours a day on the average for firing up, banking.. taking coal and water, boiler washouts, etc. That figures to 10 hours a week, 520 hours a year, or 65 extra days of productive crane time each year.



BESIDES THESE IMPORTANT EXTRAS:

Safer, cleaner operation; greater production and less operator fatigue because of air operated controls; reduced maintenance time, about one-half that of steam, and elimination of smoke nuisance and fire hazard. Write today for complete information.

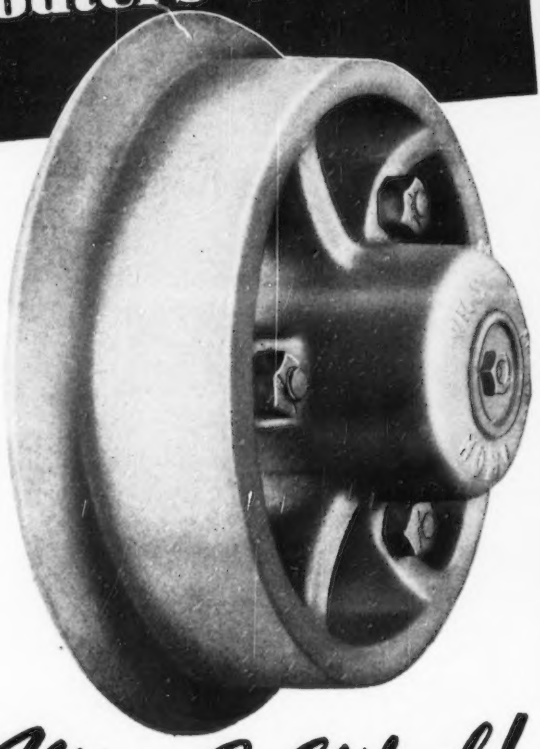
BROWNHOIST BUILDS BETTER CRANES . . . with Diesel power



INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICH. • DISTRICT OFFICES: NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO • **AGENCIES:** DETROIT, BIRMINGHAM, HOUSTON, LOS ANGELES, PORTLAND, SAN FRANCISCO, SEATTLE, SPOKANE, CANADIAN BROWNHOIST LTD., MONTREAL, QUEBEC.

Performance records prove...

...with practically no maintenance..you'll haul up to 50% greater loads on S-D "Floaters"...



Tests conducted by independent engineering firms and performance records at the mine have proved that locomotives will pull up to 50% greater loads, when cars are equipped with S-D "Floater" Wheels, instead of wheels with other types of precision bearings. But this saving in power and time is only a portion of the profit you gain by using S-D "Floaters." When it comes to maintenance you really pick up profit because S-D "Floaters" literally "hate to be greased." One greasing in 3 years is often sufficient. Common labor can demount and remount a "floater" wheel easily . . . in less time than it takes to smoke a cigarette, because no adjustment whatsoever is necessary on the bearings. Add to this the fact that the big cause of bearing failure (bearings running too tight or loose) has been eliminated and you can understand why more and more operators are specifying S-D "Floaters" for all wheel replacements. For complete information, write Sanford-Day Iron Works, Knoxville, Tenn.

America's No. 1 Mine Car Wheel!

SANFORD - DAY IRON WORKS

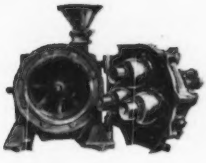
You Can Cut Today's High Production Costs with STURTEVANT EQUIPMENT

AIR SEPARATOR

For separation of fines to 325 mesh and finer. Increases output from 25% to 300% . . . lowers power costs by 50%. For years, this separator has been the standard in the cement industry.

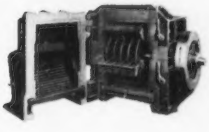
DUSTLESS BLENDER

Four-way mixing action assures a thoroughly blended product. Open-door accessibility permits easy cleaning. Available in many mixing capacities for ¼ ton per hour and up.



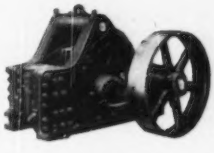
RING-ROLL MILLS

For medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operate in closed circuit with Screen or Air Separator. Open-door accessibility. Many sizes. No scrapers, plows, pushers, or shields.



SWING-SLEDGE MILLS

For coarse and medium reduction (1" to 20 mesh). Open-door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.



JAW CRUSHERS

For coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.

Sturtevant equipment, such as illustrated, helps you overcome high labor and production costs by increasing output. In addition, their rugged construction assures long life with minimum maintenance. It will pay you to investigate these machines. Write for information.

STURTEVANT MILL COMPANY

Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS
CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

MAIL COUPON TODAY!

STURTEVANT MILL COMPANY
101-A Clayton Street, Boston 24, Mass.

Gentlemen:
Please send me your catalog. I am especially interested in _____

Name _____

Street _____

City & State _____

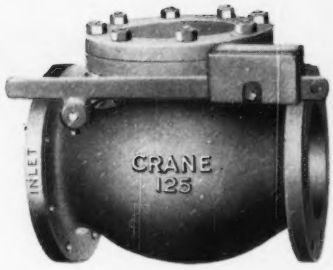
For completeness of selection
You can't beat the CRANE line

VALVES THAT PREVENT SHOCK

On liquid lines where a reversal of flow can gain considerable momentum, Crane recommends Iron Body Swing Check Valves with Outside Lever and Weight. These valves close easily and without slamming the instant flow stops... checking the reversal of flow and preventing damaging shock to pipe lines. Weight can also be mounted on lever to balance the disc, causing valve to open under minimum pressure.

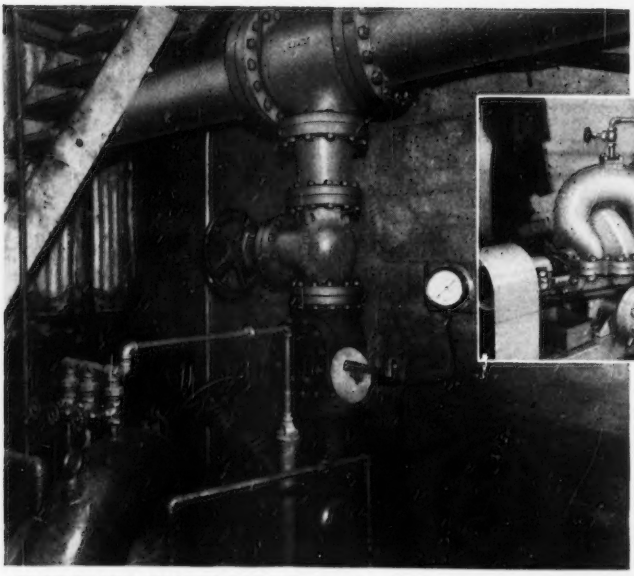
Crane Swing Checks—brass trimmed or all-iron—may be used in horizontal lines or in vertical position for upward flow. Well proportioned oval-shaped body provides ample flow area around disc when valve is open. Crane design prevents disc from sticking in open position. Flanged, screwed, or hub ends available. See your No. 49 Crane Catalog.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

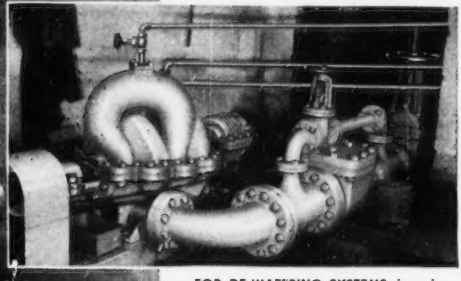


No. 373, Flanged Check. Working Pressures: Sizes 2 to 16-in.: 125 pounds steam; up to 200 pounds water, oil, gas, depending on size. Sizes 18 to 24-in.: 150 pounds water, oil, gas.

● FOR MINE PIPING INSTALLATIONS . . . ABOVE GROUND OR BELOW . . . YOU CAN "GET EVERYTHING FROM CRANE"

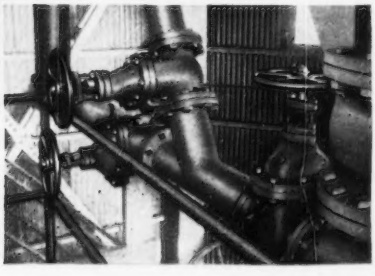


LIFTING WATER *from a deep silver mine. Crane equipment includes swing check valve with outside lever and weight, gate and globe valves, and flanged fittings.*



FOR DE-WATERING SYSTEMS *in mines, Crane supplies all piping equipment—valves, fittings, and pipe... in brass, iron, steel, and alloys.*

SETTLING CONE *in coal preparation plant showing Crane 125-pound iron body wedge gate valves with non-rising stem.*



EVERYTHING FOR EVERY PIPING SYSTEM

CRANE

VALVES • FITTINGS • PIPE • PLUMBING AND HEATING

GENERAL

COMBINES SAFETY AND STRENGTH, EXTRA TRACTION AND SPEED . . . WITH LONGER WEAR TO DO ANY JOB, ANYWHERE

FASTER! EASIER! AT MORE PROFIT!

The General L. C. M. is built to do most work off-the-road, some on. Massive lugs of rubber dig deep for non-skid traction. Tremendous shoulders resist cuts, scrapes and bruises.

The General H. C. T. does most work on-the-road, some off. Thick, deep, free-rolling ribs give safety, speed and protection against punctures on the long over-the-road hauls.

THE GENERAL L.C.M.

THE GENERAL H.C.T.

In soft, slushy ground the General L. C. M. bites in for extra traction, forward or backward. Broad lugs keep tires on top of soft surfaces.

General H. C. T. rolls safely over the highway to off-the-road delivery points; gives extra traction when you need it most.

Heavy loads require extra strength and stopping-power. The General H. C. T.'s extra deep tread works faster, lasts longer, runs and stops safer.

SPECIFY GENERAL TIRES ON YOUR NEW EQUIPMENT

If ABRASION *is Your Problem...*

look to NI-HARD *for Your Answer*

ONE OF THE HARDEST commercial products of the iron foundry is a *nickel-chromium white cast iron* trade-named "NI-HARD*".

HARDNESS RANGE

Its Brinell hardness ranges from 550 to 650 when sand cast, and 600 to 725 when chill cast.

This extreme hardness . . . at the moderate price of NI-HARD . . . provides abrasion resistance at lowest ultimate cost.

STRUCTURE

Unlike other cast irons . . . NI-HARD comprises a multitude of hard carbides firmly embedded in a matrix which is as hard as fully hardened steel. NI-HARD is unmachinable except in special cases. Finishing requirements are met by grinding or the use of cast-in-place machinable inserts.

PERFORMANCE

NI-HARD develops abrasion resistance two to three times better than that of unalloyed white iron. Therefore NI-HARD can economically replace white iron.

NI-HARD lasts one and one-half to two times as long as austenitic manganese or carbon steels, under conditions involving only moderate impact. Chill cast parts are stronger and more abrasion-resistant than comparable sand castings.

STRESS RELIEF

The strength and toughness of NI-HARD castings are increased fifty to eighty per cent, without loss in hardness or abrasion resistance, by a stress relieving treatment at 400-450°F. User experience has demonstrated the merit of specifying this treatment.

APPLICATIONS

Applications include: grinding balls, ball and rod mill liners, slurry pump parts, flotation impellers, piping, scoop lips, classifier shoes, roll heads, pulverizer rings, chutes and hopper liners, muller tires, plows, pug mill knives, clay augers. Also coke grizzly dises, crusher rolls, coal mine pumps, dredge pump impellers, liners, rings and sleeves. Also industrial food grinding burrs and attrition mill plates.

AVAILABILITY

Try NI-HARD wherever you encounter severe abrasion. See for yourself how its remarkable properties minimize replacements and repairs.

Authorized foundries throughout the country readily produce NI-HARD castings in all forms and shapes common to the iron and steel foundry.

INFORMATION AVAILABLE

Full information is yours for the asking. Write for the booklets, "Engineering Properties and Applications of NI-HARD", and, "Buyers Guide for NI-HARD Castings."

*Reg. U. S. Pat. Off.

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

Operator Russell Yeany says, "The TD-24 can't be beat; easy to control, easy on the operator. I wouldn't have any other tractor, now."

When stripping means ripping away rocks to get at the pay, the New International TD-24 is the choice of cost-conscious strip miners. This "Champion of Crawlers" puts twenty tons of toughness to work *twenty-four* hours a day in a Hawthorne, Pa., strip mine. Teamed up with another TD-24 and an International TD-18, the big "Champion" pushes five yards of shale at a time, according to its operator. The tractors work 'round the clock, taking time out only for lubrication. Six months of this rugged life has not slowed up the mighty "Champion." Only ordinary maintenance has been necessary.

Your International Industrial Power Distributor is waiting to give you positive proof of the power and performance of the International TD-24. Pay him a visit and get a new experience — a TD-24 demonstration. See how the amazing features of the TD-24 put it in a class by itself as the unchallenged "Champion of Crawlers."

INTERNATIONAL HARVESTER COMPANY · Chicago

Tune in "Harvest of Stars" with James Melton, Sundays, NBC

Standardize on Power that Pays

INTERNATIONAL HARVESTER

INTERNATIONAL INDUSTRIAL POWER

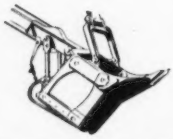
CRAWLER TRACTORS ● WHEEL TRACTORS ● DIESEL ENGINES ● POWER UNITS

MORE for your MONEY IN THIS NEW 3/4 YD. LORAIN TL-25

Thew 25 Lorain

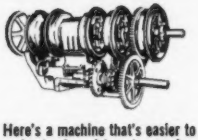
Gives You More of Everything . . .

MORE OUTPUT . . .



The Lorain TL-25 is the newest machine in the 3/4 yd. class . . . It's packed with power and speed for fast, snappy performance to produce more working cycles per minute and more yardage per day . . . The shovel has an independent cable crowd with plenty of digging power delivered right where you need it — at the dipper teeth.

MORE SIMPLICITY . . .

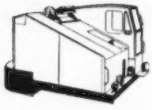


Here's a machine that's easier to understand, quicker to service, simpler to maintain . . . Each major component — clutch shaft (illustrated), engine, hoist shaft, cab, crawler propelling mechanism, may be removed and replaced as one unit. All 5 clutches are identical — you'll find more interchangeable parts on the TL-25 than on any other machine.

MORE CRAWLER MOUNTINGS

3 Crawler mountings are available for the TL-25 — all have 2 travel speeds, are chain driven, are equipped with oil-enclosed propelling mechanism, have 22" wide drop-forged treads and 4-way tread and travel lock . . . Crawlers are available in 10 ft. and 12 ft. lengths and in the wide gauge model with 11' 8" overall width for straddling ditches.

MORE "EXTRAS" . . .

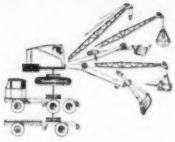


There's no charge for desirable "extras" when you buy a Lorain TL-25. All desirable "extras" are standard equipment including — 2 crawler travel speeds in both directions; power load-lowering; operating lights; electric starter and generator . . . The Lorain TL-25 is not a stripped-down, priced-down machine . . . It's a complete ready-to-work package.

MORE "LONG-LIFE" FEATURES . . .

The Lorain TL-25 abounds in new, modern features for longer life . . . All gears are machine cut; all gears, except 2, are oil-enclosed; 18 anti-friction bearings are used on the clutch shaft alone; turntable hook rollers are mounted on drop-forged brackets; crawler treads and rollers are drop forgings, with heat-treated wearing surfaces . . . And there are scores more of such features.

MORE SELECTION . . .



The Lorain TL-25 is only one machine in the TL-"Series" line of products which offers an array of capacities, interchangeable booms and mountings that makes it possible for you to select the right machine for your job from 90 possible combinations. Among these is a selection of 12 different rubber-tire carriers of 2-engine and single-engine types.

Send For This New Book!

Here's a book you must read to keep up-to-date on the latest in shovel-crane developments — it shows primary design details, explains what they will do for you on your jobs. Ask your nearby Thew-Lorain Distributor for a copy . . . or write to . . .

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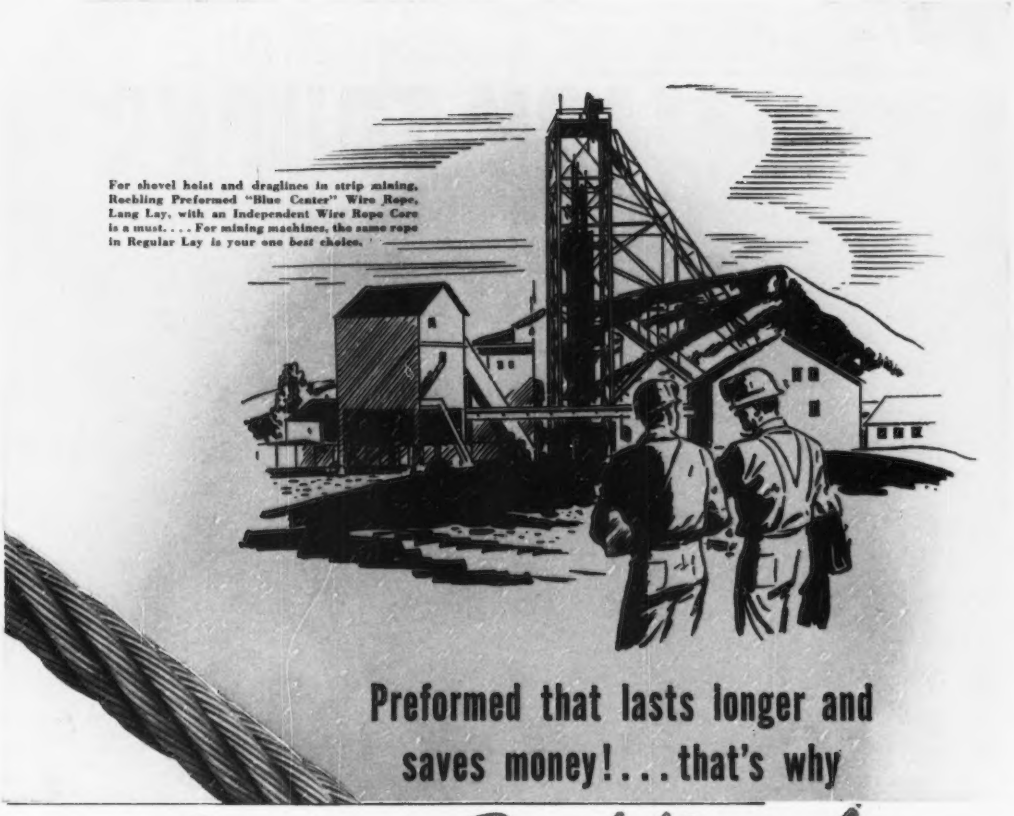

For shovel hoist and draglines in strip mining, Roebling Preformed "Blue Center" Wire Rope, Lang Lay, with an Independent Wire Rope Core is a must. . . . For mining machines, the same rope in Regular Lay is your one *best* choice.

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There's a Roebling wire rope of the right construction, grade and size for every type and make of rope-rigged equipment. Have your Roebling Field Man tell you which rope will give the best and the lowest-cost performance for every installation. John A. Roebling's Sons Company, Trenton 2, New Jersey.

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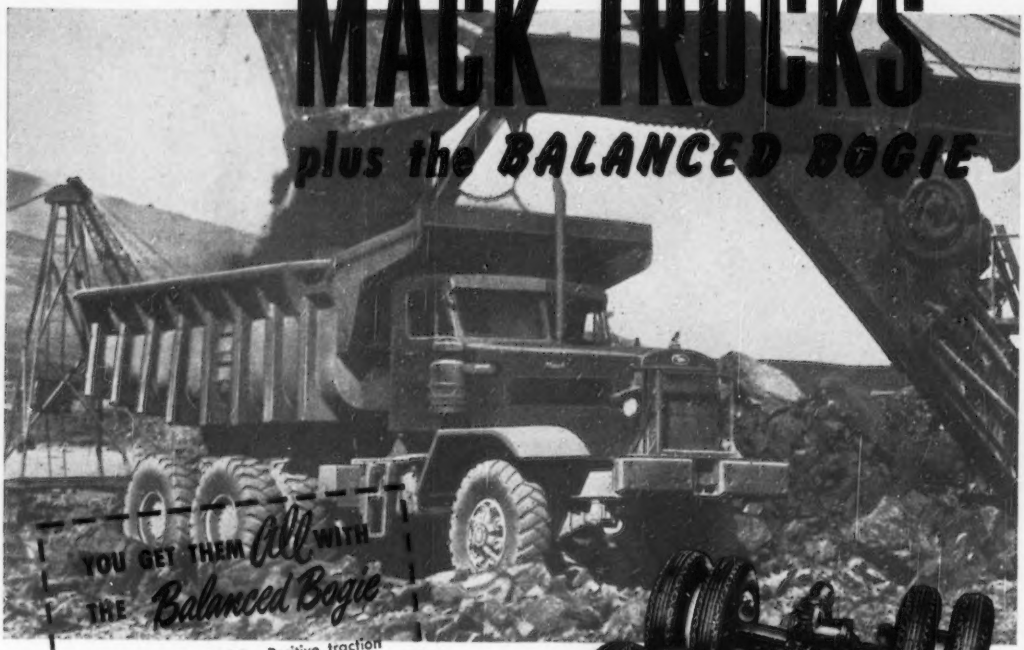

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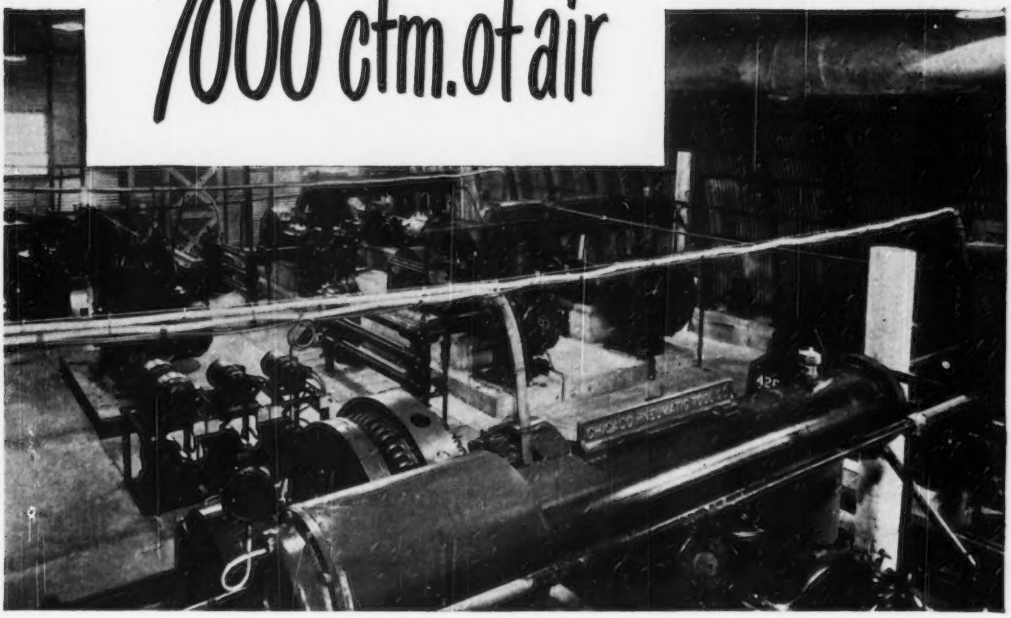
7000 cfm. of air



Here's an interesting installation of CP air compressors where a large operation depends on an unfailing and economical supply of compressed air. Four Type O-CE and two Type Y Compressors are providing 7010 cfm. of air at 100 lbs. In addition to this stationary compressor plant, six CP Portable Compressors are used for mobile operations.

In the CP line there is just the right compressor for any mining operation. The rugged, heavy-duty, horizontal-duplex Type O-CE is furnished in sizes up to 2000 h.p. The compact, space-thrifty Type Y is available in capacities of 500 to 900 cubic feet per minute, at 80 to 125 pounds pressure.

CP Portable Compressors, gasoline-driven, are available in sizes of 60, 105, 160, 210 and 315 cfm., actual capacity, and in Diesel-driven sizes of 105, 160, 210, 315 and 500 cfm.

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Today, after a grueling two-year run, the same belt is still giving uninterrupted service . . . going strong as ever!

Matching the product to the job is a Republic policy that's paved the way for success stories like this in every industry. This service, meaning trouble-free operation, is available to you. So write us today about your toughest hose or belting problems. We'll introduce you to your local Republic Distributor . . . a man who has the answers! Remember, Republic Rubber has been *the* specialist in the industrial rubber goods field for more than 48 years.

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NEW — The MARION 111-M is now available as an all-electric machine with full Ward-Leonard Control.

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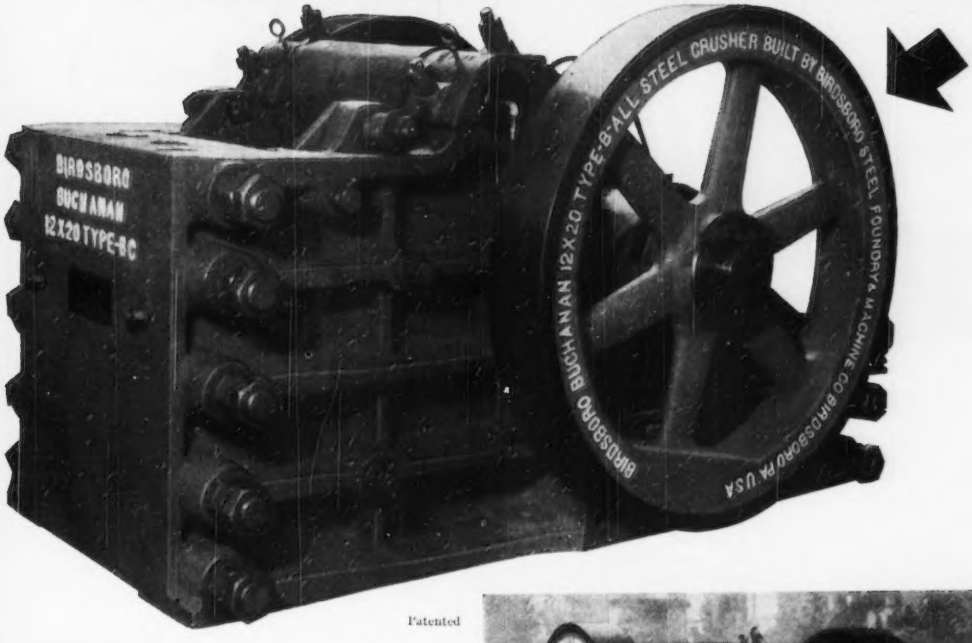
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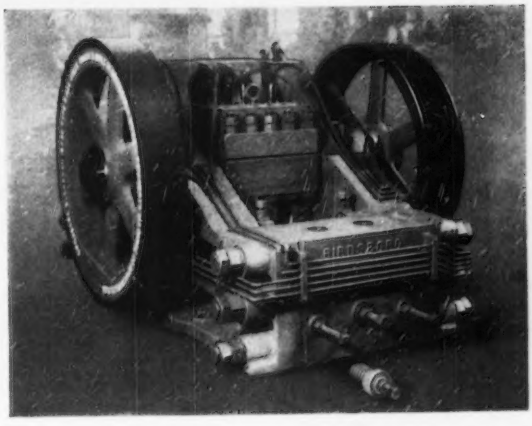

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Between the ages of 15 and 34, tuberculosis leads all other diseases as a cause of death—although at no age are you safe from TB. Yet, if everyone does his part by getting a Chest X-Ray periodically, and the majority of cases thus discovered are followed up, we can eliminate TB entirely as a public health hazard!

Will you do your part today? Get a Chest X-Ray. It may mean your life!

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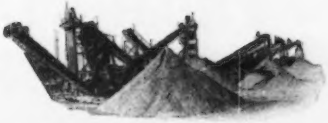

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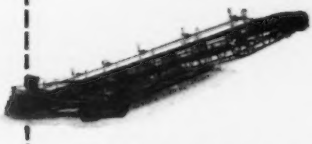

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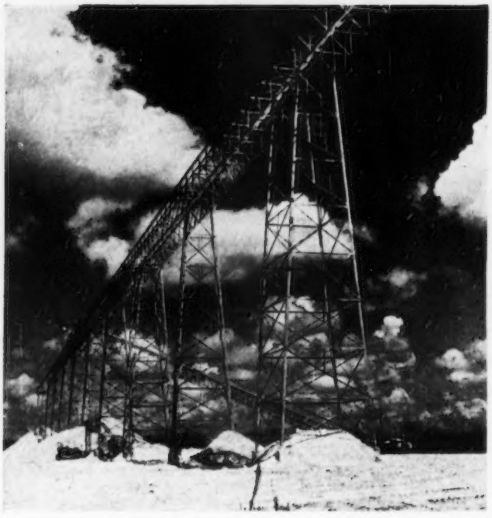

Wet rock storage area showing incline belt to trestle and trestle shuttle belt. A bulldozer pushes rock down hopper onto tunnel belt.

Incline belt to dryer receiving wet rock from tunnel reclaiming belt. View also shows dry rock storage belt gallery.

U. S. CONVEYOR BELTS INSURE CONTINUOUS FLOW OF PHOSPHATE ROCK

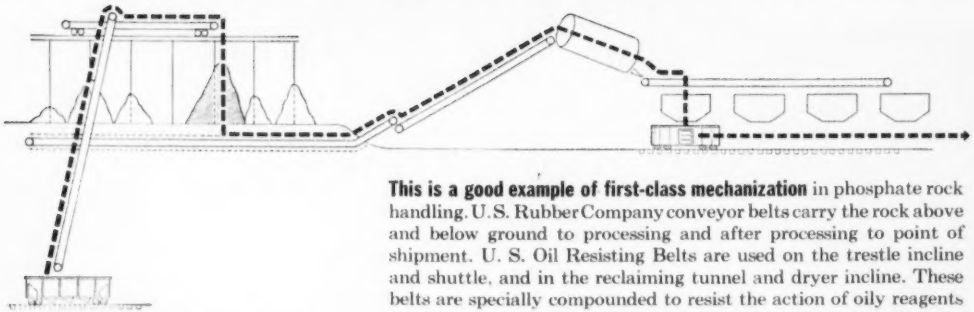

Diagram of continuous flow in phosphate rock handling field. U. S. Belting literally does all the haulage—from start to finish.

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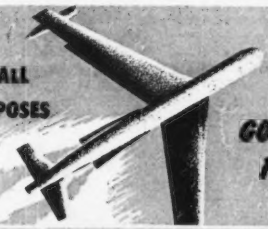
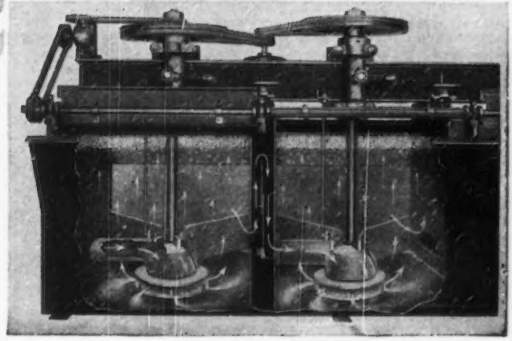


GOOD NEWS FOR YOU



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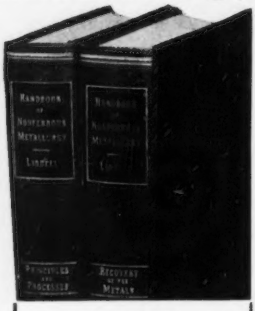

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Donald M. Liddell, Editor-in-Chief
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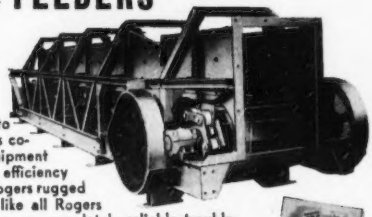

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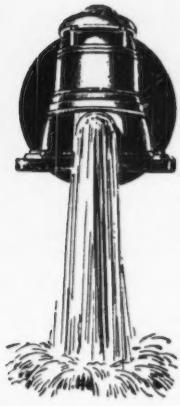

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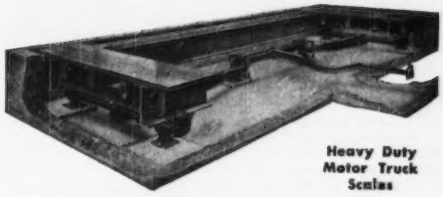

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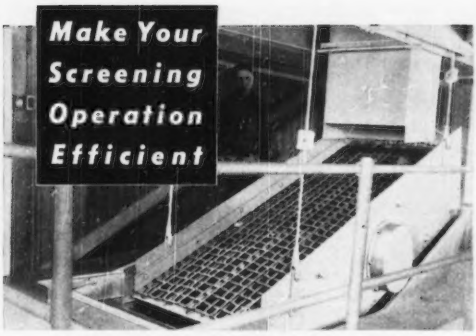

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3/4"	1.050	.824	350 lbs.	0.14 lbs.	400 ft. coils
1"	1.310	1.070	200 lbs.	0.18 lbs.	300 ft. coils
1¼"	1.660	1.380	200 lbs.	0.27 lbs.	300 ft. coils
1½"	1.900	1.610	200 lbs.	0.32 lbs.	250 ft. coils
2"	2.378	2.070	170 lbs.	0.44 lbs.	200 ft. coils
3"	3.504	3.070	165 lbs.	0.91 lbs.	100 ft. coils
4"	4.504	4.030	150 lbs.	1.25 lbs.	25 ft. Str.
6"	6.630	6.070	115 lbs.	2.23 lbs.	25 ft. Str.

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1—4" Aurora American Centrifugal Pump.
7—5" Ingersoll-Rand Motor Pumps.
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7—3" 5-Stage United Centrifugal Pumps.
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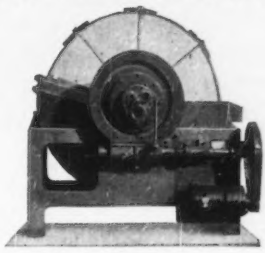

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1—9" x 21" Telsmith Jaw Crushers.
1—8" x 36" Universal All-Steel Crusher.
1—9" x 36" Cedar Rapids.
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1—10" x 24" Allis-Chalmers Jaw Crusher.
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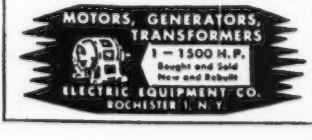

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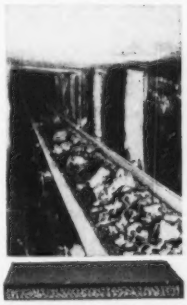

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18″	4	1/8″	1/32″	28 Oz.
20″	4	1/8″	1/32″	28 Oz.
20″	5	1/8″	1/32″	28 Oz.
24″	4	1/8″	1/32″	28 Oz.
24″	5	1/8″	1/32″	28 Oz.
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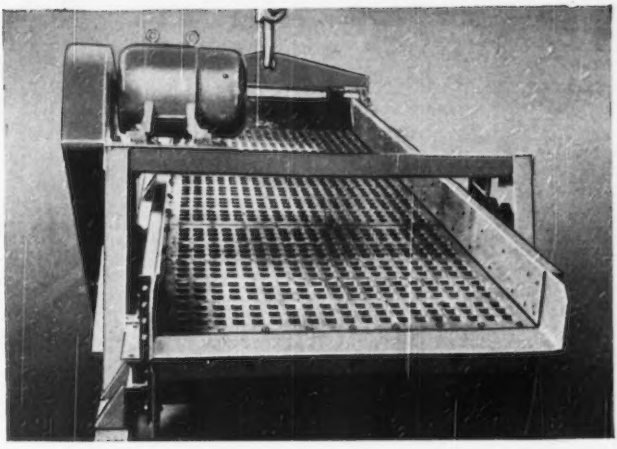

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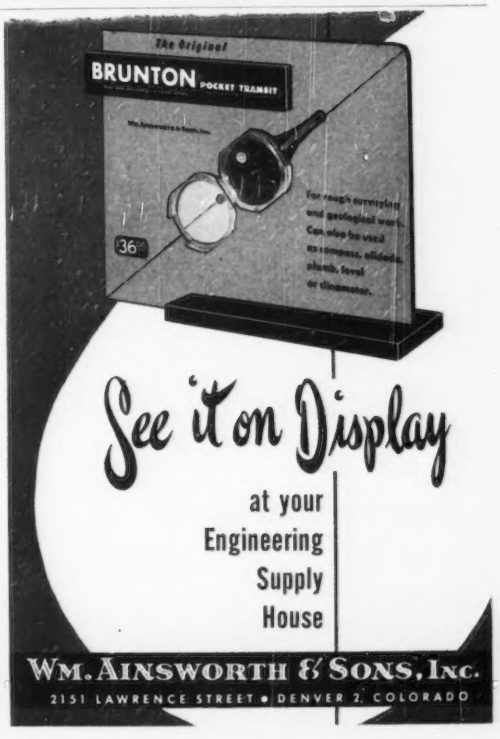

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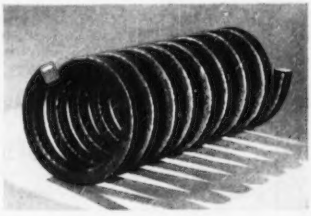
ANSWER: **Garlock 150**

Thousands of successful companies throughout the world have standardized on GARLOCK 150 for steam rods on equipment such as engines, compressors, pumps, etc.—in fact, for most steam services at pressures up to 300 pounds and temperatures up to 600° F.

You can depend on GARLOCK 150 for superior service because of its uniform, *quality controlled* construction. Start now to reduce maintenance and replacement costs on your rod packings—*standardize* on GARLOCK 150 for general steam service.

GARLOCK 150 spiral (illustrated) and GARLOCK 125 coil are made in 12½′ lengths and in packing sizes from ⅛″ to 1½″, advancing by sixteenths. Ring form—GARLOCK 200.



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In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

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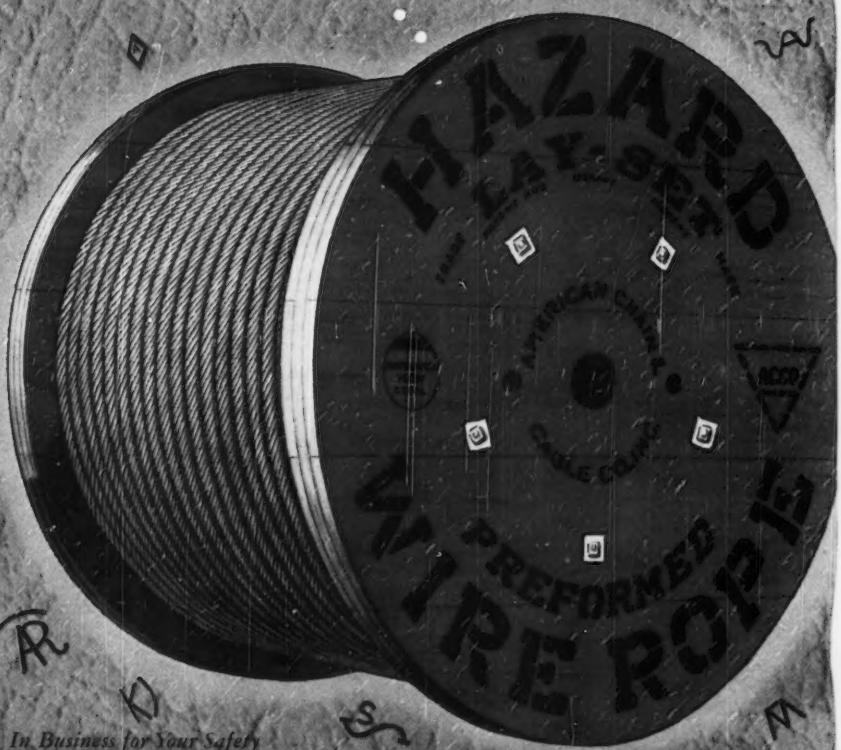

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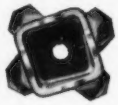
New TIMKEN® one-use rock bit with new "Spiralock" union offers 7 great advantages

1 STAYS ON MORE DEPENDABLY. New "Spiralock" union*—formed by square socket that spirals slightly as it recedes—has proved superior under actual on-the-job conditions.



2 EASIER TO GET ON AND OFF. A few blows of the drill and it's on. A few blows of a hammer and it's off. Smooth socket contours assure easy detachability.

3 MADE OF TIMKEN ELECTRIC FURNACE STEEL. Fast cutting. Long lasting. Uniform quality.

4 NON-RIFLING. The "X" cutting edge prevents rifling in any ground.

5 CROWNED CHISEL PILOT. Makes for easier starting and "collaring"—faster penetration.

6 SIMPLIFIES PREPARATION OF DRILL STEELS. Due to "Spiralock" union, steels last much longer, are easier to prepare and recondition. Square steel ends simplify fitting. They may be machined or forged.

7 ANY STEELS CAN BE USED. Existing drill steels of any size and section can be adapted quickly and easily.

THE superiority of the new Timken® one-use "Spiralock" rock bit has been proved under actual on-the-job conditions. It offers advantages no other one-use bit can equal.

This revolutionary bit is designed for jobs where bit reconditioning is impractical or undesirable. It is available in a variety of types and sizes.

To get the best bit for your job, use our Rock Bit Engineering Service. Timken and Timken *alone* offers *all three* types of bits—the famous threaded multi-use and threaded carbide insert bits as well as the new one-use "Spiralock" bit. And Timken has been solving rock bit problems for 17 years.

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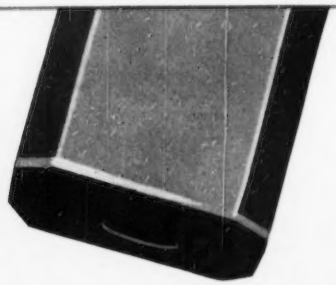
*PATENT PENDING



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TRADE MARK REG. U. S. PAT. OFF.

YOUR BEST BET FOR THE BEST BIT ... FOR EVERY JOB

1 Timken threaded multi-use rock bit.

2 Timken threaded carbide insert rock bit.

3 Timken one-use "Spiralock" rock bit.